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Hot and Cold Start Test J79-GE-5C Engine and Sundstrand Starter, Model CPS-13

by

A. R. Goolsby

OCTOBER 1967



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DIRECTORATE OF TECHNICAL SUPPORT
AIR PROVING GROUND CENTER

AIR FORCE SYSTEMS COMMAND . UNITED STATES AIR FORCE

eglin air force base, florida



HOT AND COLD START TEST J79-GE-5C ENGINE

SELECTION DE LES MANAGEMENTS

AND

SUNDSTRAND STARTER, MODEL CPS-13

BY

A. R. GOOLSBY

OCTOBER 1967



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Tinker AFB, Okiahoma

FOREMORD

This report presents the results obtained from the Environmental Starting Test of the J79-GE-5C engine using the Sundstrand Cartridge Pneumatic Starter, Model CPS-13, P/N 702601, S/N 22, Sundstrand Proposal No. 1776A-P1.

The test was conducted during the time period 17 July 1967 and 15 September 1967. The test was conducted under the authority of APGC Project Directive No. 0816V dated 20 July 1967.

The personnel listed below were responsible for the testing on this project.

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PUBLICATION REVIEW

This report is approved for publication.

R. A. SOUKUP

Colonel, USAF

Directorate of Technical Support

ABSTRACT

The purpose of this test was to determine the environmental starting capability of the Sundstrand Cartridge/Pneumatic Starter, Sundstrand Proposal No. 1776A-P1 (Model CPS-13), when used on the J79-GE-5C engine. A total of 38 starts were made during this test program, seven at normal ambient temperatures (75°F to 80°F), six at 0°F, nine at -20°F, three at -40°F, two at -65°F, nine at +59°F and two at +135°F. The first 11 runs of the program demonstrated that the J79-GE-5C engine, using a main fuel control, P/N 404045A (unmodified) and the Sundstrand Cartridge/Pneumatic Starter, Model CPS-13, would not make satisfactory starts at -20°F or lower. Runs 12 through 26 demonstrated that the same engine and starter combination equipped with a main fuel control P/N 407070 would not make satisfactory starts at 0°F in the pneumatic mode of starting, but would meet the time to idle requirement at 0°F in the cartridge mode. Runs 27 through 38 demonstrated that the J79-GE-5C engine equipped with the CPS-13 starter and a main fuel contol P/N 404045A, with the recommended modifications could make satisfactory starts throughout the temperature range of +135°F through -65°F.

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INTRODUCTION

High and low temperature starting tests were conducted on a J79-GE-5C engine, S/N G.E.-033585, using a Sundstrand prototype starter, Model CPS-13, P/N 702601, S/N 22. These tests were conducted during the time period of 17 July 1967 and 15 September 1967. The tests were conducted in the Engine Test Cell of the Climatic Laboratory, Eglin Air Force Base, Florida, under the suthority of APGC Project Directive No. 0816V, dated 20 July 1967.

The engine was a J79-GE-5B engine built to partially conform to the J79-GE-5C configuration. The major change being the transfer gear box on the front of the engine.

There was no accessory load on the engine during these tests.

The starter, Model CPS-13, used for these tests was designed and built by Sundstrand Aviation at Rockford, Illinois, for use on the B-58 aircraft. The CPS-13 starter has both a cartridge and pneumatic capability for starting. The starter being used on the B-58 at the present time has only a pneumatic capability.

The cartridges used to make the cartridge mode starts were manufactured by the Olin-Hathieson Chemical Corporation. Two different types of cartridges were used, the MXU4/A and MXU4A/A. The air supply for the pneumatic mode starts was supplied by an KA-2 gas turbine compressor operating in the test chamber at the same temperature as the test engine.

The instrumentation for the test was installed in accordance with the instrumentation list shown in paragraph TV of the General Electric Company Test Request, dated 8 May 1967, except that compressor inlet pressures were omitted due to lack of instrumentation probes to measure this parameter. The test request is included as Appendix B of this report.

The observer's log sheets are included as Appendix E of this report. The data shown on these sheets are observed data and may differ elightly from the data shown in graph form, Appendix F, which was taken from the SEL 600 Data System. Appendix C is the fuel analysis of the JP-4 refree fuel (Mil. Spec. MIL-J-5161F Grade 1) used for this test.

The purpose of this test was to determine the environmental starting capability of the Sundstrand Cartridge Pneumatic Starter, Sundstrand Proposal No. 1776A-Pl (Model CPS-13), when used on the J79-GE-5C engine.

DESCRIPTION

The test engine used for this test was a basic J79-GE-5B engine equipped with a J79-GE-5C transfer gear box and a Sundstrand Hodel CPS-13 cartridge/pneumatic starter.

Photographs of the test items are shown in Appendix A, Figures 1 through 5.

TEST PROCEDURE

The engine was serviced with MIL-L-7308F oil and MIL-J-5161F Grade I fuel for all runs. The engine was exposed to a 10 hour soak period at the test temperature prior each official test run.

The start procedure used for the official test runs was in accordance with the procedure shown in paragraph III D. 1 and 2 of the General Electric test request dated 8 May 1967, Appendix B. Three deviations were made from the recommended procedure. These deviations were on runs 24 and 26 in the pneumatic mode and run 15 in the cartridge mode. The throttle was pre-set to idle on runs 24 and 26 to determine if a faster start could be made and on run 15 the throttle opening was inadvertently delayed until the engine speed reached 10 percent.

The air supply for the pneumatic mode starts was supplied by a MA-2 gas turbine compressor, Federal Stock No. 1730-917-8014. Two types of start cartridges were used during the test, both were manufactured by the Olin-Mathieson Corporation. The two types of cartridges were: (1) MXU4/A, and (2) MXU4A/A. The observer's log sheets, Appendix E, shows the starts that each was used on.

Starts were made at +135°F, +59°F, -20°F, -40°F, and -65°F. The General Electric test request ask for two cartridge modes and two pneumatic mode starts at each of the test temperatures except +59°F where only one start in each of the modes was requested. After discussing the program with all of the agencies concerned, it was decided that three starts should be made in each start mode at each test temperature except +59°F and only one start in each mode would be satisfactory at +59°F.

The program was modified again, after run 27, following the delays caused by the difficulty experienced with the first two main fuel controls, so that one cartridge start and two pneumatic starts were made at -20°F and -40°F and one pneumatic and one cartridge start was made at -65°F and +135°F. The program was cut short in order to vacate the test cell to allow a previously scheduled qualification test on the J79-GZ-17 engine to begin. All of the runs from run 27 through 38 were made using the modified main fuel control P/M 404045A, S/M 589794.

TEST RESULTS AND DISCUSSION

A total of 38 runs were made during this test program. Seven runs were made at normal ambient temperatures, +75°F to +80°F. Six runs were made at 0°F, nine at -20°F, three at -40°F, two at: -65°F, nine at +59°F and two at +135°F.

The first eleven runs of the test were made using main fuel control P/M 404045A prior to the control being modified. The starts using this control in the unmodified condition required from 30 seconds at +59°F to 137 seconds at -20°F to reach idle speed. The +59°F starts were satisfactory but those at 0°F and -20°F required more than double the allowable time to reach idle. The decision was made to change the main fuel control in an effort to improve the starting time. A new control (a stock item) P/M 407070, S/M 577297 was sent from the Depot at Tinker AFB and installed prior to run 12. Data from one of the slow starts at -20°F using the original control, P/M 404045A, was plotted and is shown in Figure 6, Appendix F.

Runs 12 through 26 were made using main fuel control P/N 407070. Runs 12 and 13 were check runs to clear the new fuel control and fuel system of air prior to making the test runs. One pneumatic and one cartridge start was made at +59°F and both starts were within allowable time limits. Data from these starts were plotted and are shown in Figures 7 and 8, Appendix F. Three cartridge and three pneumatic mode starts were made at 0°F. These were made on runs 16 through 21. The pneumatic mode starts did not meet the time requirements in reaching idle but the cartridge mode starts were well within the 45 seconds limit for 0°F. Data from each of these starts were plotted and are shown in Figures 9 through 14, Appendix F.

Rum 22 was made to remove the moisture from the engine following a cycling of temperatures within the test chamber.

Runs 23 through 26 were made at -20°F. Three of the starts were pneumatic mode starts and one was a cartridge mode start. These starts were all extremely slow. The cartridge mode start required 77.6 seconds to reach idle speed and the pneumatic mode starts were 85.3, 86 and 82 seconds respectively. Data from one of the pneumatic mode starts, run 23, and the cartridge mode start, run 25, were plotted and are shown in Figure 15 and 16, Appendix F.

The air pressure regulator valve P/N 588811P1, S/N 6475 and the B-58 aircraft configuration piping from the air valve to the starter was removed from the starter air system for the start on run 26. This change was made to determine if the restriction through the air valve and piping was causing the slow starts. The starter air pressure was increased from 40 psig with the valve removed and the time to reach idle speed was reduced from 86 seconds to 82 seconds which was still 35 seconds more than the allowable time to idle.

The original fuel control P/N 404045A was reinstalled prior to run 27. The control had been modified to bring it up to the latest configuration for a control of this type. Four changes were made to accomplish the modification. The changes were as follows: (1) The number of holes in the differential pilot valve bushing was reduced from 4 to 2. This reduction in porting holes reduces the pilot valve gain. (2) A new orifice assembly was inserted into the drilled passage which supplies the main fuel pump discharge pressure signal to the differential pilot valve. The new orifice assembly is of the stand pipe design and contains eight .025 inch diameter holes supplying a .040 inch diameter controlling orifice. The new orifice assembly serves to dampen the pilot valve rendering it less sensitive to pulsations in main fuel pump discharge pressure.

The following changes were made to improve temperature compensation. (1) A close clearance fuel valve was added. (2) A nitrogen filled P3 reference bellows was added.

Runs 24 and 28 were made to check the engine operation and purge the fuel system of air following the main fuel control change. The data from run 28 was plotted and are shown in Figure 17, Appendix F.

Runs 29 through 31 were made at $-20^{\circ}F$. Two of these runs were made using the pneumatic mode of starting. Run 29 was made with the air regulator valve and \bar{b} - $5\bar{s}$ piping in the starter air line and run 31 was made with this equipment removed. There was a 5 psig difference in the air pressure to the starter and a 10.1 seconds difference in the time to reach idle speed, showing that the sir valve and piping were restricting the pressure and flow to the starter. Run 30 was a

cartridge start. Data from these three starts are shown in Figures 18 through 20, Appendix F. Starts on runs 29 and 30 were slower than the 47 seconds allowable time to idle, but run 31 required only 41 seconds to reach idle speed which was well within the allowable time. There was one other difference between the two pneumatic starts at -20°F that may have contributed to the faster start on run 31. A check was made of the amount of leakage from the P&D valve after run 30 and it was found to be approximately twice the normal leakage. The solinoid valve in the drain line was closed to prevent any leakage on the start for run 31. However, the fuel flows at time of light off showed a difference of only six pounds per hour. Time did not permit a thorough investigation of this condition.

Runs 32 through 34 were made at -40°F. An oil leak developed on run 32 at the mounting flange of the secondary nozzle pump. Run 33 was made to locate the exact source of the leak. It was decided, due to the limited time available to complete the test, to continue without replacing the pump. The leak was located around the shaft seal of the secondary nozzle pump. Data from runs 32 and 34 were plotted and are shown in Figures 21 and 22, Appendix F.

Runs 35 and 36 were made at -65°F. The engine failed to fire on the first two attempts on run 35. The third attempt resulted in a good start and a normal acceleration to idle speed. Two possible explanations for the failure to light off on the first two attempts could have been a frost covered fuel nozzle or frost covered ignition plugs, which was cleared by the first two start attempts. Data from the two runs were plotted and are shown in Figures 23 and 24, Appendix F. Both starts were well within the allowable start time at -65°F.

Runs 37 and 38 were made at +135°F following soak periods at +160°F. The pneumatic start, run 37, was slower than the cartridge mode start on run 38 due to the lower starter air pressure at +135°F. However, both starts were well within the 55 seconds allowable start time at +130°F. Data from these two starts are shown in Figures 25 and 26, Appendix F.

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CONCLUSIONS

- 1. The J79-GE-5C engine equipped with the main fuel control P/N 404045A (unmodified) or the main fuel control P/N 407070 and the Sundstrand Starter Model CPS-13 would not meet the cold weather start requirements.
- 2. The J79-GR-5C engine equipped with a modified main fuel control P/N 404045A and the Sundstrand Starter Model CPS-13 would make satisfactory starts throughout the temperature range of $\pm 135\,^{\circ}\text{F}$ to $\pm 65\,^{\circ}\text{F}$.

RECOMMENDATION

1. If the Sundstrand Starter Model CPS-13 is to be used on the J79-GE-5C engines, it is recommended that the main fuel control be modified to improve the temperature compensation and to reduce idle rumble.

APPENDIX A

PHOTOGRAPHS OF TEST INSTALLATION



Fig. 1.J-79-GE-5C engine mounted on test stand

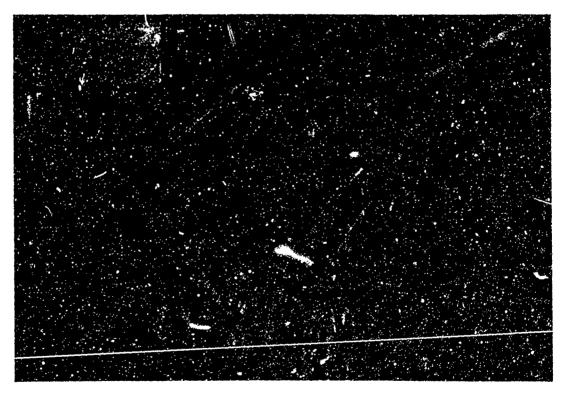


Fig. 2, Lower front view of J-79-GR-5C engine showing the Sundstrand Starter and air valve with air inlet piping from the air valve to starter



Fig. 3, Close up view of Sundstrand Starter mounted on J-79-GE-5C engine



Fig. 4. Close up view of starter air valve

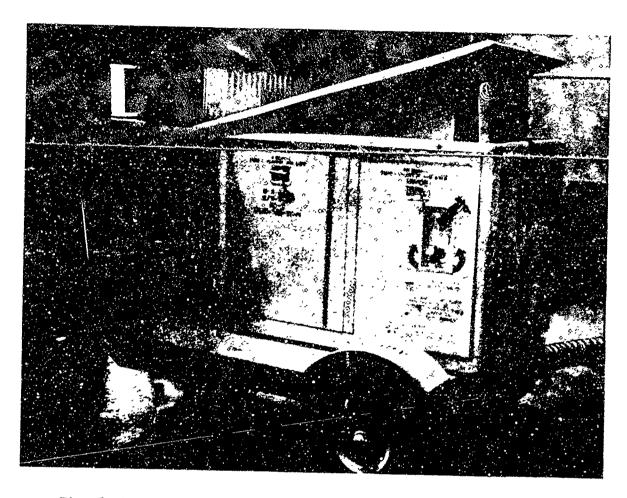


Fig. 5. View of Ma-2 gas turbine generator used to supply air to the Sundstrand starter.

APPENDIX B

LETTER OF INSTRUCTIONS AND TEST REQUEST

OCNEPE 6 June 1967

B58/J79-5C Engine Starter Climatic Tests, Contract AF 33 657-67-C-0553

APGC (Art Goolsby) Eglin AFB, Fla. 32542

- 1. The purpose of these tests is to determine the environmental starting capability of the Sundstrand Cartridge Pneumatic Starter, Sundstrand Proposal No. 1776A-P1 when used on the J79-5C engine. There is no requirement for simulated aircraft accessory loads in either mode of starting during these tests. Basically, these tests will be conducted in two phases:
- a. Verify the G.E. Co. base line operation for the test engine, S/N 033585, without accessory loads.
- b. Determine the environmental starting characteristics of the engine and the starter capability in both modes of operation.
- 2. General Electric Company will furnish the engines base line data obtained during cell testing at Evendale, Ohio. They will also supply a complete basic engine minus aircraft QEC components. It is planned to have the engine on site at Eglin by the 15th of June. In addition to the engine SAAMA will furnish a T300J start cart which is scheduled for arrival at Eglin during the latter part of June. SAAMA/SANBTA (Mr. Ed Gray) will also be responsible for supplying the necessary Sundstrand Starters used in these tests. This starter shall use approved Air Force type MXU-4/A series gas generating cartridge in these tests.
- 3. The attached G.E. Test Request contains the instrumentation requirements for the Eglin facility and those which G.E. Co. will record on their equipment. It also includes test procedures, special instructions and soak times. However, OCAMA Service Engineering (OCNEPE) requires that three starts be performed instead of the two starts which G.E. programmed in Part V of the test procedures. Otherwise the Test Request has been reviewed and is considered acceptable.

4. Your cooperation in this matter is appreciated. Please contact OCNEPE, Mr. W. L. Cramer/2229 if additional information is required

FOR THE COMMANDER

KENNETH C. KNIGHT Chief, Propulsion Branch Directorate of Materiel Management

or if hardware problems develop.

1 Atch Test Requests for Environmental Starting Tests

Cy to: SAAMA (SANBTA, Mr. Gray) AFGLPS (Mr. Huggins) Test Request for TPS D-57-F, D-57-F1 "Environmental Starting Tests • J79-5C Engine"

May 8, 1967

E. D. Fagen
G. E. Representative
Eglin AFB, Florida

I. PURPOSE OF TEST

Environmental starting tests of the J79-5C with Sundstrand Cartridge Pneumatic Starter (as described in Sundstrand Proposal Nr. 1776A-Pl) at Eglin AFB, Florida. Determine the environmental starting capability of the engine without aircraft accessory loads (simulated) utilizing both cartridge and pneumatic mode starter operation. The test will be conducted in three phases as follows:

- a. Established a base line of operation for the test engine (S/N 033585) at Evendale without accessory loads at STP under both operating modes.
- b. Verify the Evendale established base line of operation for the test engine (S/N 033585) at Eglin without accessory loads.
- c. Determine the environmental starting capability of the engine without aircraft accessory loads (simulated) utilizing both cartridge and pneumatic mode of starter operation.

II. PARTS TO BE TESTED

- A. J79-5C engine S/H 033585 with applicable gear boxes.
- B. Cartridge/Pneumatic starter as described in Sundstrand Engineering Proposal No. 1776A-P1, Vol. 1.

III. SPECIAL INSTRUCTIONS

A. Starter imlet pressures and temperatures supplied to the starter for environmental testing should be consistent with the pneumatic mode data shown in the referenced Sundstrand Proposal.

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III. SPECIAL INSTRUCTIONS (Cont.)

- B. Transient data recordings (or reproduction thereof) are required for all starts in this TPS.
- C. Any steady state data taken at idle speed is also required.
- D. Starts are to be made utilizing the following procedures for throttle actuation.
 - 1) Pneumatic mode: When engine speed reaches 10% advance the throttle to idle position (12° measured at fuel control input shaft).
 - 2) Cartridge mode: Advance the throttle to idle position (12° measured at fuel control input shaft) and apply ignition an instant before energizing the start switch.

It is requested that a throttle stop be provided to the cell operators input throttle to prevent advancing engine throttle beyond 12° during the starting test at both Evendale and Eglin locations.

- E. The fuel used in the tests shall be per Spec. MIL-J-5161F, Grade 1 (Ref. GE Spec. E-714E, dated 9/22/66) and oil will be per Spec. MIL-L-7808F, (Ref. GE Spec. E-714-E dated 8/22/66).
- F. An engine brake shall be used if necessary during soak for environmental tests to prevent rotation while soaking.
- G. It is desired to use shop air for pneumatic starts at Evendale and a rated A-lA cart for pneumatic starts at Eglin.
- H. Dynamic fuel manifold pressure measurements should be very close coupled and for cell readouts for idle readings, a solenoid valve should be installed in the cell readout line at the engine tap off point. This solenoid valve will be in a closed position for all environmental baseline and Eglin starts to prevent abnormal manifold fill times.
- I. Fuel temperature, a specific gravity sample and a barometer reading are to be taken just prior to each start for Evendale and Eglin tests.

III. SPECIAL INSTRUCTIONS (Cont.)

1/2.

- J. A top off line with a three-way Solenoid valve utilized at the top off point should be installed on the drain line from the P&D valve. This provision is desired so that any P&D valve leakage may be drawn off into a container during start, but will allow any steady state leakage and shutdown drainage to be relived through the normal path.
- K. Record the manufacturer and date of manufacture of each cartridge used on each run. This should be available on the cartridge container.
- L. The engine will be equipped with an oil tank so the lube system will be self contained.

IV. INSTRUMENTATION

GR, Evendale will plan to supply 1 eight channel Sanborn recorder and operator. Parameters are as follows:

		Start 1	sode
Parameter	Sanborn Scales	Pneu.	Cart.
1. Engine Speed	0 to 1000 rpm 0 to 2500 rpm 0 to 5500 rpm	х х <u>х</u>	X X X
2. Fuel Flow	0 to 1000 lb/hr 0 to 3000 lb/hr	X	X X
3. Compressor Discharge Wall Static Press.	0 to 10 psig 0 to 40 psig	X	X X
4. Exhaust Gas Temp.	-65 to 300°F -65 to 1435.F	X	X X
5. Starter Inlet Pressure Total	0 to 50 psig	<u>X</u>	NA
6. Starter Inlet Temp.	-65 to 440°F	X	ra
7. Fuel Manifold Press.	0 to 200 psig	<u>x</u>	x

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IV. INSTRUMENTATION (Cont.)

		Start M	ode
Parameter	Sanborn Scales	Pneu.	Cart.
8. Cart. Breech Press.	0 to 2000 psig	NA	X
9. #4 Fuel Nozzle Temp.	-65° to 2400°F	x	x
10. #9 Fuel Nozzle Temp.	-65° to 2400°F	AA	x
The following data is to be	recorded on Eglin's	Digital Syst	em:
Parameter		Range	
Engine Inlet Temperature (T	2)	-70 to 1	70°F
Starter Inlet Valve Actuati	on	(0 to 1)	
#2 Bearing Temperature		-70 to 5	()0°F
Lube Pump Discharge Pressur	e	0 to 10	O psia
Scavenge Pump Discharge Pre	ssure	0 to 100	0 psia
Spark Rate #4 Can		••	
Fuel Nozzle Thermocouple #4		0 to 100	0°F
Engine Speed		(0 to 55	00 rpm)
Fuel Plow, Main		0 to 300	0 1b/hr
Fuel Plow, Verification		0 to 300	0 1b/hr
Compressor Discharge Wall S	tatic Pressure	0 to 40	psig
Exhaust Gas Temperature (EG	T 5.1)	(-65 to	1435°F)
Fuel Manifold Pressure		0 to 200	psig
Exhaust Hozzle Ares (A8)		Min to M	ax
Stator Angle (B1)		Min to M	ax

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IV. INSTRUMENTATION (Cont.)

Parameter	Range
Throttle Angle ()	Min to Max
Fuel Nozzle Thermocouple #9	0 to 1000°F
Starter Air Pressure (Inlet)	0 to 50 psig
Starter Air Temperature (Inlet)	-70 to 450°F
Starter Breech Pressure	0 to 2000 psia
Engine Inlet Pressure, Static (PS2)	0 - 25 psia
Engine Inlet Pressure, Total (Pt2)	0 - 25 psia

V. TEST PROCEDURES - EGLIN

Phase I (GE, Evendale)

Phase I consists of testing at GE, Evendale to establish engine performance, mechanical integrity and base line data.

Phase II (Eglin AFB)

Phase II consists of Eglin AFB checkout and Evendale Base Line Verification.

Run 1 - Eglin

Start engine under same mode and with same engine and starter conditions as in Run 1 and 2 - FPD. Operate engine at idle for 10 minutes to stabilize and take 3 data readings a 1 to 2 minute intervals, then shutdown engine. Engineering from Evendale will supply information regarding engine and starter conditions at Evendale.

Run 2 - Eglin

After satisfactory comparison of idle data with Evendale base line, make a start again with engine and starter conditions as in runs 1 and 2 - FPD. Again compare Eglin data with Evendale base line. May 8, 1967 - E.D. Fagan - Page Six

V. TEST PROCEDURES - Eglin (Cont.)

Run 3 - Eglin

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Make a start with conditions as in Runs 3 and 4 - FPD. Compare with Evendale, base line.

After satisfactory baseline comparison and instrumentation verification, proceed with Phase III environmental tests.

Phase III, Part I (Eglin AFB, Environmental Tests)

Perform the following runs (Starts):

Run No.	Engine Inlet Air °F Temp	Starting Pneu. (ACC <u>Loads</u>	Soak & Run Requirements
4-Eglin	+135	x	-	None	x
5-Eglin	+135	x	•	None	x
6-Eglin	+135	•	X	None	X.
7-Eglin	+135	•	X	None	x
8-Eglin	+52	_ X	-	None	XX
9-Eglin	÷59	-	x	Norte	XX
10-Eglin	-20	x	-	None	XX
11-Eglin	-20	x	•	None	XX
12-Eglin	-20	•	x	None	ХX
13-Eglin	-20	-	X	None	XX
14-Eglin	~40	x	~	None	XX
15-Eglin	~40	x	-	None	XX
16-Eglin	-40	•	x	None	XX

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V. TEST PROCEDURES - Eglin (Cont.)

Run No.	Engine Inlet Air °F Temp	Startin <u>Pneu</u> .	g Modes <u>Cart</u> .	ACC Loads	Soak & Run Requirements
17-Eglin	-40	-	x	None	XX
18-Eglin	-65	x	•	None	XXX
19-Eglin	-65	x	-	None	XXX
20-Eglin	-65	-,	x	None	xxx
21-Eglin	= 65	, ess	x	None See It	XXX tem VI

Phase III, Part I (Eglin AFB, Environmental Tests)

It is expected that ambient starts below -40°F in cartridge mode could possibly result in hang-ups or deceleration after starter cut out; depending upon cartridge burn time and engine light off. In such cases, as A Go and No-Co existing for two trys at a particular temperature, a third ron will be programmed in cartridge mode for that condition. Any hangups in pneumatic mode operation will also be repeated.

VI. SOAK TIME

7

Requirements

- * The engine and its oil system to be subjected to a soaking period of 4 hours beginning from the time engine inlet air temperature stability at +160°F. The oil, air and fuel supplied to the engine during the start vs be at +135°F.
- The engine and its oil system to be subjected to a soaking period of six (6) hours beginning from the time engine inlet air temperature stabilizes at the specified inlet air temperature, or until the engine #2 bearing reaches the same temperature as the specified inlet air temperature, (+5°F) which ever represents the longer times. The oil, air and fuel supplied to the engine during the start to be the same as the specified inlet air temperature.

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VI. SOAK TIME (Cont.)

*** The engine and its oil system to be subjected to a soaking period of six (6) hours beginning from the time engine inlet air temperature stabilizes at -65°F or until the engine #2 bearing reaches a temperature of -60 to -65°F which ever represents the longer time. The oil, air and fuel supplied to the engine during the start to be at -65°F.

John C. Smith J79/J93 QEF Evaluation Building 500, K-54, Ext. 4894

APPENDIX C

FUEL ANALYSIS

FUELS	TEST REPORT	DATE			
SUBMITTED BY	TEST LABORATORY AND LOCATION	ORIGIN OR	20 July 1967 ORIGIN OR CONTRACTOR		
Mr. A.R. Goolsby/PGVWT	PGVWP, Eglin AFB, Fl				
LABORATORY TEST NUMBER	<u> </u>				
DATE RECEIVED IN LAB	20 Jul 67				
SPECIFICATION NUMBER	T5161-E				
GRADE NUMBER	JP-4, Grade 1				
CONTRACT NUMBER					
QUANTITY REPRESENTED (GALS)					
TYPE CONTAINER AND NUMBER	Gal. Can				
SAMPLE NUMBER					
REMARKS (PERTAINING TO SAMPLE AS RECEIVE	Referee Fuel				
WESTERFORKERSK Sp. Gr.	.758				
GRAVITY *A.P.I.	55.18				
WSIM					
APPEARANCE	Clear				
COLOR	Water White				
ODOR					
WATER REACTION	No. 1				
FREEZING POINT *F	Below -67				
CORROSION	No. 1				
EXISTENT GUM, MG/100 ML	.4	·			
POTENTIAL GUM, MG/100 ML					
OXIDATION PPT. MG/100 ML					
DOCTOR TEST					
MERCAPTAN SULFUR, % WT.					
TOTAL SULFUR, 2 WT.					
VAPOR PRESSURE, P.S.I. Ø 100° F	2.85				
ANIUNE POINT *F	133				
ANILINE GRAVITY CONSTANT OR B. T. U.	67319				
SMOKE POINT MM (OR SMOKE VOL INDEX)					
AROMATICS, % OLEFINS, %					
TETRAETHYLIEAD ML/GAL					
FLASH POINT, *F					
KNOCK RATING	LEAN RICH	LEAN RICH	LEAN RICH		
TOTAL SQUIDS, MG/GAL	.52	ALAN XICH	- CEAN ANGIN		
FIBROUS MATERIAL PER/QT					
VISIBLE FREE WATER ML/GAL					
NONCOMBUSTIBLE SOLIDS MG/GAL					
TOTAL WATER, PPM BY VOL BY KARL FISCHER					
THERMAL STABILITY, TUBE DEPOSIT CODE NO.					
THERMAL STABILITY, PRESSURE DIFF. (N. HG.)					
MIL-1-27686 ICIN & INHIBITOR, \$ 8Y VOL					
DISTILLATION	18P°F 152 147°F	187°F 167°F	18P°F 167°F		
RÉMARKS (PERTAINING TO USABILITY AND DISPOSITION OF MATERIAL)	102 211 221 14	10% 208 221	10% 221		
DISCOSINGIA OF MATERIALI	20x 229 275 45	20% 275	20% 275		
	40% 264 290 52	40% 290	40% 250		
MATERIAL REPRESENTED BY SAMPLE	50% 280 370 90	50% 278 370	50% 370		
110.	90% 363 400 95	90% 400	90% 400		
(IS) (IS NOT) SATISFACTORY FOR USE	10% 50% 470	16% 50% 470	10% 50% 470		
	E PT. 467 REC98.6	E PT. REC	E PT. REC		
	RES X 1.0 LOSS .4		RES % LOSS		
	C-1		IGNATURE OF LAB SUPV)		
	<u> </u>	nevin A. Hlme			

AFTO FORM 68

SUPERSEDES SEP 63 EDITION WHICH WILL BE USED.

APPENDIX D

TABULATED START DATA

179-08-5c engine s/n 033-585

160 Parantes	REM 400 power from Son 4440 mm	Starter air supplied by Mc. 1 a	Starter atraumited by Mc	subsequent runs unless noted otherwise		This was the first controlos stant		min.59 sec. granking 2nd Attempt on run.no.?	Engine failed to reach idle anced	Engine failed to reach idle aread	3rd attempt on run 8	Check run	Check run	Check run at 00F	Check run to check engine after control	change. Starter air valve and B58 air inlet to starter piping installed prior to this start.
Certridge Burn Time	;	ł	i	;	ł	16.7	i	ŧ.	:	i	;	i	;	ł		
AVE. Stertor Breech EreszaReig	ţ	ł	;	ł	i	855	i	ł	;	;	8	ł	i	;		
AVE. Starter Air Press FSIG	8	32	58	જ	50	1	58	58	917	947	52	51	52	32	36	
Peak Puol Flor	1695	1887	1948	1959	1936	2036	751	2011	802	803	1819	1820	1950	1849	1819	
Piet Flow At Fire PEH	732	999	726	692	892	757	(83		216	929	82	720	240	633	602	
100	1132	905	853	1002	1034	જૂ	599	929	932	096	7000	1000	1060 7	9 th 29	910	
Time To Idle	!	89	40.0	36.3	35.8	32.7	+	137	:	1	53	37	30	100.5	73.9	
Time To Fire Sega.	17.7	7.41	7.6	10.7	6,6	7.6	12.9	10.5	1104	10.1	9.3	10.1	9.1	30.5	17.6	
in the second	7 80	780	65 y	459	459	459	-50	83	£3	459	459	459	£3	£ ₀ 0	670	
H SS	~	(Å	ო	4	พ	9	7	2		ထ	ω	٥.	og C	ជ	ं य	
Date 1967	27/2	1/18	61/2	61/2	7/20	0Z/Z	1/51	1/21	7/54	1/5th	1/25	1/25	7/25	1,26	8/35	

FUN SUMMARY 179-01-50 Encine S/N 039-585

Benerice	Chack run	Good start	Good start	Good start	Good start	Check run to remove moisture from engine	Slow start	Slow start	Slow start	Slow atant, The starter Air Velve Wes removed for this start				
Certridge Furn Time Sec.	i	:	17	i	ł	:	17	18	18	ł	ŀ	ţ	19	;
Ave. Starter Breech Press.	;	;	825	1	;	;	028	800	810	i	1	2	22	i
Ave. Starter Air Press. FSIG	36.5	37	;	04	39	03	:	;	1	36	37	017	;	қ
Pask Flow	1940	1950	1986	1915	1873	1879	1904	1869	1893	1830	1933	1854	2040	1936
Nel Flow At Pare	685	255	821	757	789	356	230	242	233	685	725	707	719	212
N SO	1110	गता	285	831	93.5	877	832	8	356	1140	219	795	657	\$30
Time To Idle														
Time To Sec.	8°41	34.5	11.2	35.6	17.6	८ -शर	***	10.1	10.5	35.5	15.4	£-41	12.3	11.2
Test Og	485	\$3	459	0	0	0	0	•	•	£75	-50	200	8	-50
No.	2	#	প্ল	91	17	38	33	R	5	83	g	ਕੋ	%	56
7967 1367	37.78	8/16	8/17	8/18	8/21	22/8		8/s#	8/25	8/28	8,289	8/30	8/31	1/6

T9-03-50 Engine s/n 033-585

Person rich	Check run after irstalling modified	and there was to completely clear the	tuer control or war Good start excapt a little slower than Jestinal	There was a delay in breach press.	indication due to inde entric This start was made with the fir reg.	the starter air line Good start except a little slover than desired.	This run to check for oil leak, the	deed use to show up on with run dood start : The B-58 air regulator walve and piping to the startor were	This was a 3rd attempt start, the engine	dend start	Good start	Good start
Cartridge Burn Time Sec.	;	i	:	i	:	50	;	i	6 8	19	i	ट-गर
Ave. Starter Breech Press.	;	;	;	795	i	760	i	i	;	750	;	980
Ave. Starter Air Press.	37.5	38	9†		rg.	:	57.5	917	94	1	32.5	•
Feet Flore PFH	1905	2000	1953	1973	0 गुरु	1979	1968	1975	1979	2100	2161	2103
Puel Flow At Fire	1090 650	1150 630	159	653	999	635	930	Çi1	633	610	556	589
Max EDT	1090	1150	939	क्रा	212	3 48	01/9	655	312	874	1182	1130
Time To Idle	647	27	51.1	52	1 4	52.9	煮	SZ,	24	3	52	37.7
Ties To Fire	ħ	12.8	11.9	ឌ	10.5	32.8	ដ	13.5	ន	13.4	13.9	10.3
Test Jenp.	9 9	780	8	8	-50	07	o r	037	-65	2 65	4135	4135
Run	23	88	53	93	æ	32	33	*				38
1967	8/6	8/6	6/6	9/10		21/6 D-7	21/6	21/6	9/23	9/13	₹7./6	8/15

APPENDIX E

OBSERVER'S LOG SHEETS

		OBSERVER'S LOG		PAGE NO.		
JET ENGINE MOD		IENGINE CERIAL N	10.	I RUN NO.		
J79-GB-			GE-033585	1		
DATE	~	TEST TEMPERATURE (P)	PUEL.	TIME PHOINE STARTED		
17 July	1967	+80 Outside Air	MIL-J-5161F Grade 1	1427		
FUEL SYSTEM US		LUGE OIL GRADE	NG, LBS. OF OIL USED DURING RUN	TIME KHSINE STOPPED		
Normal		MIL-L-7808F		1429		
TEST OPERATOR		BAR. TEMPERATURE	RELATIVE HUMBITY %	TOTAL TIME OF RUN		
Demosey			:02			
HRS COLD SOAK	PRIOR TO START	FT LBS BREAK AWAY TORQUE	Maximum Cranking RPM			
		TIME TO REACH-	:02			
TIME TO PIRE	MAH 19 SEC	5000 RPM MH 105 BEC	MAX TPY DURING START 1130	Cardwell		
	-	PURPOSE OF RUN	1130	BAR, READING		
RUN DORN TIME	2 MEN 23 SEC	To chec's angine af	ter installation.	i !		
TIME	RPM		REMARKS			
1427	0	a -5C. The transfer of A MA-IA will be used to Sundstrand starter, Minstalled. The engine fixed at 1 peak fuel flow was 95 31 psig and starter will be used to the used to the starter will be used to the used to the starter will be used to the used t		d. arter. S/N 22 I flow. The pressure was 8.		
1429:15	5000	Shut down.				

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		OBSERVER'S LOG		PAGE NO.			
ET ENGINE MOD	RUN NO.						
J79-GE-	-	enoine herial		2			
J/J-GB-	~	TEST TEMPERATURE (P)	GE-033585	TIME ENGINE STARTED			
		+80°F Outside Air	Į.				
18 July 1967		LUSE OIL GRADE	MIL-J-5161F Grade 1	1339			
		MIL-L-7808F	NO. 288. OF OIL GED DUNING KON				
Normal		MAR, TEMPERATURE	RELATIVE HUMBITY %	1347			
TEST OPERATOR			RELATIVE HOMOITY %				
Dampsey		+80°F	MAXIMUM CRANKING RPM	:08			
HRS COLD SOAK PRIOR TO START		PT LES ENEAR AWAY YORQUE	MAXIMUM CHPHAIRS RPM	_			
		TIME TO REACH-		:10			
TIME TO FIRE	MM 13.5**C	1	MAX TPT DURING START 970 0F				
	13.5	5000 RPM MH 87 SEC	9/0	Cardwell			
AUN DOWN TIME	2 MH34k SEC	1		5			
		To check engine aft		30.01" Nga			
TIME	RPM	<u></u>	Remarks				
1339	0	The engine fired at 1040 rpm with 660 pph fuel flow. The peak fuel flow was 1680 pph. The starter air pressure averaged 30 psig with a peak starter inlet air temp. of 338°F. The starter was cut out at 3000 rpm and 62 seconds.					
1341:30	5150	Set speed to 5900 rpm and back to idle to exercise control.					
1342	5200	Enter cell to inspect engine. Engine was OK.					
1343	5200	Set throttle to 5900 rpm and back to idle to exercise fuel control.					
1347	5200	Shut down.					
		NOTE: There was very	little rumble on this ru	m.			

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AP-EGLIN AFB, FLA.

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- 1	- A.K.	ne bi	•
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	<u>at magadi in Mahan da papa da Met. Par</u> tik	OBSERVER'S LOG		PASE NG.	
JET ENGINE MOTE	IL.	ENGINE SERIAL	. NO.	1 Run no.	
	J79-GE-5C GE-033585				
DATE		TEST THE PERATURE (FF)	FUEL	THE ENGINE STARTED	
19 July	1967	+59	MIL-J-5161F Grade 1	1129	
FUEL SYSTEM USE		LUCE OIL GRADE	KO. LES. OF OIL USED DURING RUN	TIME ENGINE STOPPED	
Normal		MIL-L-7808F		1132	
TEST OPERATOR		BAR. TEMPERATURE	RELATIVE HUGGOTT'S	TOTAL TIME OF RUN	
Dempsey		+81°F		:03	
HE COLD SOAK P	YEATS OT ASIM	PT LES BREAK AWAY TORQUE	MAXIMUM CRAHKINS RPLI	TOTAL TIME ON EHRINE	
15½				:13	
		TRÆ TO REACH-		TEST OBSERVER	
TIME TO FIRE	MM 7 SEC	5500 man 140 se	MAX TPT OURING START 925	Cardwell	
		PURPOSE OF RUN		ear, reading	
RUH DOWN TIME	2 MIN 14 SEC	To obtain data at +	-59°F.	30.04" Hga	
TIME	RPM		REMARKS		
1129	0	poak fuel flow was a pressure was 850 ps:	1060 rpm with 700 pph fuel 2350 pph. The peak starter ig with an average of 840 p	r breech	
1131:30	5150	burn time was 164 se	down while checking idle	lead band.	
		NAMES AND ASSESSED FOR PARTY OF THE PARTY OF			

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AF-EGLER AFB, FLA.

	والمناز المراج المنازي	OBSERVER'S LOC		PAGE NO.
JET ENGINE MODEL		AIRSKANIONS		1 RUN NO.
		AIKSEAMIONS		4
J79-GE-SC		GE-033585	TIME ENGINE STARTED.	
19 July 1967	i	1257 TEMPERATURE (*P) +59	MIL-J-5161F Grade 1	1508
FUEL SYSTEM UNED		LUGE OIL GRADE	NO. LES. OF OIL USED DUNING RUN	TIME THEIRE STOPPED
Normal	- 1	MIL-1-7808F		1510
TEST OPERATOR		BAR, TEMPERATURE	RELATIVE HUMEDITY &	TOTAL TIME OF MUN
Dempsey	- 1	+82°F		:02
HRS COLD SOAK PRICE TO	STARY	FT LOS BREAK AWAY TORQUE	MAXIMUM CRANKING RPM	TOTAL TIME ON ENGINE
35	l			:15
		THE TO REACH		TEST OBSERVER
TIME TO PIRE MEN 9.	5 sec	5150 RPM MH 36 SK	C MAX TPT DURING START 1000	Cardwell
я ин поянтнак 2 мл	15 *2c	To obtain starting	data at +59°P.	30.03" Hga
TIME RI	P.M		REMARKS	
1510 518		Prior to this start moved from No. 4 and Fuel mozzles, F/N 86 The engine fired at peak fuel flow was laveraged 50 psig with	fuel nozzles, P/H GE867C 4 No. 9 combustion cans. GG 492P3FA, ware installed 1250 rpm with 755 pph fuel 1975 pph. The starter sirth a peak pressure of 51 pm a starter was cut out at 30 meters.	92P3 were re-

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		OBSERVER'S LOG		PAGE NO.
JET ENSINE MOD		IAIRZE SHIBHS	. NO.	I RUN NO.
J79-GE-			GE-033585	5
BATE		TEST TEMPERATURE (FF)	FOEL	TIME ENSING STANTED
20 July		+59	MIL-J-5161F Grade 1	0810
FUEL SYSTEM US	KO	LUSE OIL GRADE	NO. LEE. OF OIL USED DURING RUN	i .
Normal		MIL-1-7808F		0811 TOTAL YIME OF RUN
TEST OPERATOR		HAR. TEMPERATURE +77°P	MECULIAR HONSDILA 2	:01
Dempsey	PRIOR TO START	PT LES BREAK AWAY TORQUE	MAAIMUM CHANKING RPM	TOTAL THE OH ENSINE
17			1	:16
		THE TO REACH		TEST OBSERVER
TIME TO FIRE	MN 9.8 BEC	5000 RPM MIN 36 SE	: MAX TPT OURING START 1035	Cardwell Cardwell
RUN DOWN SIME	2 MIN 6% SEC	PURPOSE OF RUN	J	BAR, READING
	Z 08	To obtain starting	REMARKS	30.11" Hga
TIME	7.5		TEANCH THE TEACHER	
0811	5200	was 50 to 51% paig was cut out at 25 so Shut down.	with a peak temp. of 362°F aconds and 3000 rpm.	· Tue regiter

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AF-EGLIN AFB, FLA.

		OBSERVER'S LOG		PAGE HO. 1
JET ENGINE MOD	EL	ENSINE SERIAL N	RUN HO.	
J79-GE-5	C		6	
DATE		TEST YEMPERATURE (PF)	FUEL	TIME ENGINE STARTED
20 July		+59 ° ₽	MIL-I-516lFGrade 1	
FUXL SYSTEM US	(D	LUSE OIL GRADE	NO. LES. OF OIL USED DURING RUN	
Normal .		MIL-1-7808F	<u> </u>	1510
TEST OPERATOR		BAR. TEMPERATURE	RELATIVE HUMOITY %	TOTAL TIME OF RUN
Dempacy	POINT TO STARY	+78°F	MAXIMUM CRAHKING RPM	:03
	57 minutes	THE BALLAN AWAY TORGOT	:19	
		TIME TO REACH-	TEST OBSERVER	
TIME TO FIRE	8.5 stc	5100 mm Mn 33 sec	MAR TPY DURING START 960	Cardwell
		PURPORE OF RUN		BAR, READING
RUN DOWN TRAS	2 MH 22 SEC	To obtain starting of	leta at +59°%.	30.15" Hga
TIME	RPM		REMARKS	
1507	0	peak fuel flow was 225	100 rpm with 770 pph fuel 50 pph. The starter bree d averaged 860 psig. The	ch pressure
150\$:50		dead band. The dead a degrees indicated on the	s was shut down while che band appears to be betwee throttle position indicat ck was made after the rur ed.	en 8 and 14 cor.
		of 383°F. The follows	with a peak temp. on star ing speeds and time was r , 1500 rpm at 16 seconds as the maximum speed obta	noted: and 1580 rpm

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AP-EQLIH AYB, FLA.

		OBSERVER'S LOG		PAGE NO.
JET ENGINE MOD		ENGINE SERIAL N		1 NUN NO.
J79-GE-		ENGINE SERIAL N	GE-033585	7
DATE	1 Table 1 (1991 1991 1992 1992 1992 1992 1992 1992 1992 1992 1992 1992 1992 1992 1	TEST TEMPERATURE (85)	FUEL	TIME ENGINE STARTED
21 July		-20	MIL-I-5lol Grade 1	0910
FUEL SYSTEM US	20	LUBE OIL GRADE	HO, LBS. OF OIL USED DURING RUN	
Normal		MIL-1-7808F		0913
TRET OPERATOR		BAR, TEMPERATURE	RELATIVE HUMODITY %	TOTAL TIME OF HUN
Demosey		+74°P	MAXIMUM CRANKING UPM	:03
See Log	PRIOR TO START	PI LUS ENERR ANAT ICRUOL	22	
		TIME TO REACH		TEST OBSERVER
TIME TO PINE	14N 9.8 SEC	5000 RPM 2 MM 16 AEC	MAX TET DURING START 635 9	Cardwell .
AUN DOWN TIME	1 MH 364 *EC	To obtain starting	date at -20°F.	30.16" Hga
TIME	RPM		REMARKS	
	·			
		NOTE: The MA-2 will be	we used to supply sir to	the starter.
0802	0	starter air pressure temp. of 326°F. The approx. 2100 rpm. At seconds the speed was 2340 rpm. The engine 2 minutes and 25 seconspeed dropped very li	320 rpm with 640 rph fuel was 60 psig with a peak of engine speed began to sle elapsed time of 1 minute 2280 rpm and max. speed was cranked with starter nds. The starter was cuttle. The throttle was rated at 2 minutes and 30	starter air ow down at a and 30 reached was r assist for t out and returned to
0910	0	was 655°F and E.G.T. a throttle was advanced noticeable effect. 2nd Attempt: The engine fired at 1 poak fuel flow was 20059 psig with a peak in	d hang-up was 725 pph. 12 at speed hang-up was 580 during the speed hang-up 280 rpm with 640 pph fue 00 pph. The starter air nlet temp. of 331°F. The	F. The p with no like the starter was a starter was
0913	5159	Shut down.	nd 53 seconds and 3000 r	ym.

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AF-EGLDI AFB, FLA.

		OBSERVER'S LOG		PASE NO.
JET ENGINE MODI		INCOME SERIAL I		1
J79-GE-5			GE-033585	8
DAYE 24 July	1967	TEST TEMPERATURE (*F)	MIL-J-5161FGrade 1	THE ENGINE STANYED
FUEL SYSTEM US		LUDE OIL ERADE	NO. LES. OF OIL USED DURING NUN	
Normal		MIL-L-7808F		1307
TEST OPERATOR Dempsey		BAR. TEMPERATURE 81	ARLATIVE HUMBITY %	TOTAL TIME OF HUN
HRS COLD SOAK	PRIOR TO START	FT LES GREAK AWAY TORQUE	MARIMUM CRANKING RPM	TOTAL TIME ON EMBINE
		THE TO REACH-	:24	
TIME TO FIRE	MEN 9.3 SEC	5150 RPM MH 51 SEC	MAX TET DURING START 1000 F	Carter
RUN DOWN THE	2 MM 17 SEC	PURPOSE OF RUII		BAR, READING
THE	Z I/	Check run.	NEWARKS	30.04" Hga
				
0914	0	the fuel flow. The C control has been disc Starter on: The engine The fuel flow at fire for 1 minute and 45 s was 2800 rpm. The st 45 seconds with the st to 2840 rpm. The air The fuel pressure (Bo was 790 pph. E.G.T. BOXE: Prior to the s C.D.P. reference drain signal line remained Second attempt: The The fuel flow at fire for 1 minute and 45 s was 2890 rpm. The st seconds. The throttl	econd strempt the main for a line was disconnected	at 1300 rpm. e was cranked ngine reached inute and speed increased was 48 psig. peak fuel flow uel control and the C.D.P. nds at 1250 rpm. e was cranked ngine reached inute and 45 nutes. The
1305	0	flow was 790 uph. Ma 25 July 1967 Prior to this attempt control has been re-c Third attempt: The e peak fuel flow was 18	ngine fired with 700 pph 19 pph. The starter was starter air pressure wa	to the main fuel fuel flow. The cut out in 33
1307	<i>5</i> 150	Shut down.		

APGC STORM, 0-332

		OBSERVER'S LO	0 G	elle Charles and an all an an annual and an annual and an annual and an an annual and an annual and an annual a	PAGE NO.
JET ENGREE MOD	7 L	1 2 16 PM	MENIAL N	7.	RUM NO.
J79-G2-5			,	GE-033585	9
DAYE 25 July	1967	+59	,	MII-J-516lFGrade 1	THE ENGINE STARTED
FUEL SYSTEM UO	E9	LURE OIL GRADE		HO. LES. OF OIL USED DURING RUN	
Normal TEST OPERATOR		MIL-L-7808F		RALATIVE NUMBER &	1340 YOTAL THE OF HER
Dempsey		+84°P			:01
HAS COLD SOAR	PRIOR TO START	FT LSS SREAK AWAY FOR	COLE	MAXIMUM CRAICHING HPM	TOYAL YIME ON ENGINE
TIME TO FIRE	MEN 9 SEC	тыж то пеасы- 5150 ярм — мя	# sec	MAX TPT DURING START 1030	TEST OBSERVER CAPTES
RUN DOWN TIME	2 MM 27 AEC	PURPOSE OF RUM To check engin	ne with	out engine fuel boost.	29.98" Hga
TIME	RPM			REMARKS	
1339	0	run. This was having any effective engine fire was 1820 pph.	done to ct on e d with The sta r tempe	740 pph fuel flow. The rter air pressure was 52 rature was 365°F. The a	pesk fuel flow
1340	5150	Shut down.			

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AF-EGLIN AFB, FLA.

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		OBSERVER'S LOG	ing in secure . The interest control is a first of the control in	PAGE NO.
JET YEINE MOD	EC.	JAINE SKIDNE	NO.	ลวห พอ.
√79-GE-5	ic		GE-033585	10
DATE		TEST TEMPERATURE (PP)	FUEL	TIME ENGINE STARTED
25 July		+59	MIL-J-5161F Grade 1	1350
PUEL SYSTEM US	ED	LUGE OIL GRADE	NO. LES. OF OIL USED BURINS RUN	1
Normal		MIL-L-7808F	AGLATIVE HUNGSITY \$	1351
		+84°F	HULLING HOMESTER S	:01
Dempsey	PRIOR TO START	FY LBS GREAK AWAY TORQUE	MARINUM CRANKING RPM	TOTAL TIME OH EHGIN
				:26
		TIME TO REACH		TEST OBSERVER
rime to rire	141 9.1 SEC	5150 жэн ын 34 вес	MAX TPT DURING START1060	Carter
TUN DOWN TIME	2 MH 23 SEC	PURPOSE OF RUN	• •	BAR, DEADING
		To obtain starting	والمتعارف والمتعارف والمتفاق والمتعارف والمتعارف والمتعارف والمتعارف والمتعارف والمتعارف والمتعارف والمتعارف والمتعارف	29.98" Hg
TIME	RPM		REMARKS	سوكاكس فسلوان فالتسميم وكسساء
1350	0	ficw was 1950 pph The air temperature win 25 seconds at 3000	apparent difference between	sas 52 psig. as cut out
1351	5150	Shut down.		
	,			

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Z-10

AY-EGLD ATT, TLA.

		OBSERVER	LOG		PAGE HO.
ET ENGINE MOOR	L	IK!	M JAINSE ZKIÐ	O.	RUN NO.
J79-GB-50	C	1		GE-033585	11
PATE		TEST TELPERATURE	£ (a b)	PUZL	TIME ENGINE STARTED
26 July	1967	0°F		MIL-J-5161F Grade 1	0809
UEL SYSTEM USE	0	ECARS JIO SOUL		NO. LBS. OF OIL USED DURING RUN	5
Normal		MIL-L-7808			0812
TEST OPERATOR		DAR. TEMPERATURE	•	RELATIVE HUMOITY %	:03
Demosey His cold soak P	RIOR TO START	FY LES EREAR AWAY	TORQUE	MARINUM CHANRING RPM	TOTAL TIME ON ENGINE
16					:29
		THE TO REACH			TEST OBSERVER
TIME TO FIRE	MIN 10 BEC		# 100 sec	MAX TPT DURING START 630 P	Cardwell
		PURPOSE OF RUN			SAR, READING
RUN DOWN TIME	1 MM 633 SEC	To obtein	starting o	lata at 0°F.	29.99" Нва
TIME	RPM			REMARKS	
0809	0	peak fuel f averaged 57 and 3000 rps	low war 162 pass and a n. The en 2500 rpm	280 rpm with 640 pph fue 20 pph. The starter air starter was cut out 4t 7 gine speed reached 2350 at 53 seconds. Speed in	pressure 5 seconds rpm at 37
0811:30	5150	Shut down.	-	drain fuel was approxima	tely 3½ pints.
	**************************************		in de la company de la comp		ap-rolin app, fla

APGC FORE 0-332

1967 109 YO SYARY MIN 15.5 SEC 2 MIN 38 SEC RPM	NOTE: Main fuel control P/N 4070 An air valve P/N 5888 starter using the 358 made at the request o er from pressures about expected at cold temp	GE-033585 FUEL MIL-J-5161F Grade 1 MO. LOW. OF OIL USER OURING KUN RELATIVE HUMBOITY % MAXIMUM CHANKING RPM MAX YPT DURING START 915 TON after control change. REMARKS rol P/N 404045A,S/N 58979 70,S/N 577297 installed. 11P1, S/N 6475 was install configuration. This install configuration. This install sundstrand Company to pose 60 psig from the MA-2	1942 TOTAL TIME OF RUN 105 TOTAL TIME ON ENGINE 134 TEST OBSERVER Cardwell BAR. READING 30.02" Hga 4 removed.
: 1967 IOR YO SYARY MEN 15.5 SEC 2 MIN 38 SEC	CHISTOR AIT 470°F LUBE OIL GRADE MIL-I-7808P BAR. YEMPERATURE 4-78°P FT LOS BREAK AWAY TORQUE THE TO REACH- 5100896 MM 72 SEC FURPOSE OF RUM TO check engine operat NOTE: Main fuel cont Fuel control P/N 4070 An air valve P/N 5888 starter using the 358 made at the request o er from pressures abo expected at cold temp	GE-033585 FUEL MIL-J-5161F Grade 1 MO. LOW. OF OIL USER OURING KUN RELATIVE HUMBOITY % MAXIMUM CHANKING RPM MAX YPT DURING START 915 TON after control change. REMARKS rol P/N 404045A,S/N 58979 70,S/N 577297 installed. 11P1, S/N 6475 was install configuration. This install configuration. This install sundstrand Company to pose 60 psig from the MA-2	12 TIME ENGINE STARTED 0937 TIME ENGINE STOPPED 0942 TOTAL TIME OF RUN :05 TOTAL TIME OF ENGINE :34 TEST OBSERVER Cardwell BAR. READING 30.0211 Hg a 4 removed.
: 1967 IOR YO SYARY MEN 15.5 SEC 2 MIN 38 SEC	CHISIDE AIT +70°F LUSE OIL GRADE MIL-I-7808P BAR. YEMPERATURE +78°P FY LOS BREAK AWAY TORQUE THAN TO REACH- 5100896 MM 72 SEC FURPOSE OF RUM TO check engine operat NOTE: Main fuel cont: Fuel control P/N 4070 An air valve P/N 5888 starter using the 358 made at the request o er from pressures abo expected at cold temp	MIL-J-S161F Grade 1 NO. LOW. OF OIL USED OURINS KUN RELATIVE HUMSDITY 3 MAXIMUM CHANKING RPM MAX YPT DURING START 915 ** ion after control change. REMARKS rol P/N 404045A,S/N 58979 70,S/N 577297 installed. 11P1, S/N 6475 was install configuration. This insif Sundstrand Company to pure 60 psig from the MA-2	TIME CHOINE STATED 0937 TIME CHOINE STOPPED 0942 TOTAL TIME OF RUN ;05 TOTAL TIME ON ENGINE ;34 TEST ORSERVER Gardwell BAR. READING 30.0211 Hg at 4 removed.
IOR YO STARY MEN 15.5 ^{SEC} 2 MIN 38 SEC	MIL-I-7808P BAR. YEMPERATURE -78°P FY LOS BREAK AWAY TORQUE THE TO REACH- 5100892 MM 72 SEC PURPOSE OF RUM To check engine operat NOTE: Main fuel cont: Fuel control P/N 4370 An air valve P/N 5888 starter using the 358 made at the request o er from pressures abo expected at cold temp	MAXINUM CHANKING RPM 100 after control change. THEMARKS TOL P/N 404045A,S/N 58979 70, S/N 577297 installed. 11P1, S/N 6475 was install configuration. This install configuration. This install sundstrand Company to poss 60 psig from the MA-2	TIME ENSINE STOPPED 0942 TOTAL TIME OF RUN 105 TOTAL TIME ON ENSINE 134 TEST OBSERVER Gardwell BAR. READING 30.02" Hga 4 removed. Led before the stallation was protect the start-
MEN 15.5 ^{SEC} 2 MEN 38 SEC	TO Check engine operations: When you have to reached the property of the prop	MAX YPT DURING START 915 Ton after control change. REMARKS rol P/N 404045A,S/N 58979 70,S/N 577297 installed. 11Pl, S/N 6475 was install configuration. This install sundstrand Company to pose 60 psig from the MA-2	TOTAL TIME OF RUN ;05 TOTAL TIME ON ENGINE ;34 TEST ORSERVER Gardwell BAR. READING 30.02" Hga 4 removed.
MEN 15.5 ^{SEC} 2 MEN 38 SEC	THE TO REACH- 5100ADM MAN 72 SEC FURFOCE OF RUN TO check engine operat NOTE: Main fuel cont: Fuel control P/N 4070 An air valve P/N 5888 starter using the 358 made at the request o er from pressures abo expected at cold temp	MAX YPT DURING START 915 Ton after control change. REMARKS rol P/N 404045A,S/N 58979 70,S/N 577297 installed. 11Pl, S/N 6475 was install configuration. This install sundstrand Company to pose 60 psig from the MA-2	:05 TOTAL TIME ON ENGINE :34 TEST OBSERVER Cardwell BAR. READING 30.02" Hga 4 removed. led before the stallation was
MEN 15.5 ^{SEC} 2 MEN 38 SEC	THE TO REACH- 5100000 MMN 72 SEC PURPOSE OF RUN To check engine operat NOTE: Main fuel cont: Fuel control P/N 4070 An air valve P/N 5888 starter using the 358 made at the request o er from pressures abo expected at cold temp	ion after control change. REMARKS rol P/N 404045A,S/N 58979 70,S/N 577297 installed. 11Pl, S/N 6475 was installed. configuration. This installed Sundstrand Company to pose 60 psig from the MA-2	TOTAL TIME ON ENGINE 134 TEST ORSERVER Gardwell BAR. READING 30.02" Hga 4 removed. Led before the stallation was protect the start-
MEN 15.5 ^{SEC} 2 MEN 38 SEC	THE TO REACH- 5100+9% MM 72 SEC FURFOCE OF RUN To check engine operat NOTE: Main fuel cont: Fuel control P/N 4070 An air valve P/N 5888 starter using the 358 made at the request o er from pressures abo expected at cold temp	ion after control change. REMARKS rol P/N 404045A,S/N 58979 70,S/N 577297 installed. 11Pl, S/N 6475 was installed. configuration. This installed Sundstrand Company to pose 60 psig from the MA-2	134 TEST OBSERVER Cardwell SAR. READING 30.02" Hga 4 removed. Led before the stallation was protect the start-
2 мян 38 явс	5100hps MMM 72 sec PURPOSE OF RUM To check engine operat NOTE: Main fuel cont: Fuel control P/N 4070 An air valve P/N 5888 starter using the 358 made at the request of er from pressures aborexpected at cold temp	ion after control change. REMARKS rol P/N 404045A,S/N 58979 70,S/N 577297 installed. 11Pl, S/N 6475 was install configuration. This install sundstrand Company to pose 60 psig from the MA-2	Cardwell BAR. READING 30.02" Hga 4 removed. Led before the stallation was
2 мян 38 явс	To check engine operat. NOTE: Main fuel cont: Fuel control P/N 4070 An air valve P/N 5888 starter using the 358 made at the request o er from pressures abo expected at cold temp	ion after control change. REMARKS rol P/N 404045A,S/N 58979 70,S/N 577297 installed. 11Pl, S/N 6475 was install configuration. This install sundstrand Company to pose 60 psig from the MA-2	30.02" Hga 4 removed. led before the stallation was
	NOTE: Main fuel control P/N 4070 An air valve P/N 5888 starter using the 358 made at the request of the from pressures about the respected at cold temp	TEMARKS rol P/N 404045A,S/N 58979 70,S/N 577297 installed. 11Pl, S/N 6475 was instal configuration. This instal sundstrand Company to pose 60 psig from the MA-2	30.02" Hg a 4 removed. Led before the stallation was protect the start-
	NOTE: Main fuel control P/N 4070 An air valve P/N 5888 starter using the 358 made at the request o er from pressures about expected at cold temp	TEMARKS rol P/N 404045A,S/N 58979 70,S/N 577297 installed. 11Pl, S/N 6475 was instal configuration. This instal sundstrand Company to pose 60 psig from the MA-2	4 removed. led before the stallation was protect the start-
n r a	Fuel control P/N 4370 An air valve P/N 5888 starter using the B58 made at the request o er from pressures abo expected at cold temp	rol P/N 404045A,S/N 58979 70,S/N 577297 installed. 11Pl, S/N 6475 was instal configuration. This ins of Sundstrand Company to p	led before the stallation was protect the start-
	starter using the B58 made at the request o er from pressures abo expected at cold temp	configuration. This ins f Sundstrand Company to p we 60 psig from the MA-2	tallation was rotect the start-
1			
0	740 pph leveling off pressure was 37 psig	a wat pre-start. The pea at 650 pph fuel flow. The with a peak air temperatu maximum cranking speed wa	e starter air ire before the
0	peak fuel flow was 18 37 psig with a peak t opened at 10 seconds	20 pph. The starter air comperature of 394°F. The and 1000 rpm. The starte	pressure was throttle was
515 0	Exercised throttle to several cycles.	obtain 6200 mpm and back	t to idle through
5150	Shut down.	•	
	5150	o The engine fired at 1 peak fuel flow was 18 37 psig with a peak to opened at 10 seconds manually cut at 3000 5150 Exercised throttle to several cycles.	The engine fired at 1250 rpm with 685 pph fuel peak fuel flow was 1820 pph. The starter air 37 psig with a peak temperature of 394°F. The opened at 10 seconds and 1000 rpm. The starter manually cut at 3000 rpm and 55 seconds. Startised throttle to obtain 6200 rpm and back several cycles.

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AV-EOLIN AVE, YLA.

		OBSERVER'S LOG		PAGE NO.
ET ENGINE MODE	·	UNG THE SERTAL	MO.	RUN NO.
	_	unaime sektial	GR-033585	13
J79-GE-5	X;	TEST YEMPI NATUME (*P)	IFUEL	TIME ENGINE STARTE
15 Augus	t 1.967	Outside Air +85°F	MIL-J-5161F Grade 1	1046
UKL SYSTEM USE	D C	LUSE OIL GRADE	NO. LES. OF OIL USED DURING RUN	ž –
Normal		HIL-L-7808F		1048
UST OPERATOR		BAR. TRMPERATURE	RELATIVE HUMOITY &	TOTAL TIME OF RUN
Gower				:02
ms cold soak P	RIOR TO START	PT LES GREAK AWAY TORQUE	MARISUM CRANKING RPM	TOTAL TIME ON RHEI
IME TO PIRE	MH 14.8*EC	THE TO REACH- 5100 RPM MIN 42 SEC	MAX YPT DURING START 1110 P	TEST OBSERVER Cardwell
BMIT HOOD NU	MIN SEC	PURPOSE OF RUN		30.03" Hga
TIME	RPM	To opposite the second second	REMARKS	
1048	5180	was 375°F. Shut down.		
1048	5180	Shut down.		
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APGC 2, SEP 1, 0-332

AF-ROLIN AFR, FLA.

	PAGE NO.			
JET EHEME COD	EL.	(Enche Bertal I	10 .	MUN HO.
J79-GE-	J79-GE-5C GE-033585			14 THE NAME SVARTED
16 Augu	st 1967	+59	MIL-J-5161F Grade 1	0822
POTES!	70	LUGE OIL GRADE NIL-L-7808F	NO. LSE OF OIL USED DURING RUN	0824
TEST OPERATOR		BAR. TEMPERATURE	RELATIVE HUMBITY S	TOTAL YBIE OF RUN
Gowex		+76°F		:02
HRS COLD SCAN	PRIOR TO SYARY	FT LBS BEZAK AWAY TORQUE	Maximum Granking RPM	TOTAL TRIE ON ENGINE 38:
TIME YO FIRE	13.5 sec	THE TO REACH- 5100 reps and 41 sec	MAX TPT DURING START 1115*	rasy ossyaven Cardwell
RUN DOWN TIME		PURPOSE OF BUH		BAR. READINE
	2 MIN 20 SEC	To btain starting de	بالحر والمتناول المنتهي المتناول المتناول والمتناول والمتناول والمتناول والمتناول والمتناول والمتنا	30.06:Hga
TIME	RFM		REMARKS	
0822	0	The engine fired at 1180 rpm with 750 pph fuel flow. The peak fuel flow was 1940 pph. The starter air pressure was 38 psig with a peak air temperature before the air valve of 350°F. The starter switch was manually cut at 3000 rpm and 32 seconds.		
0824		Shut down.		

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AF-POLIN AFB, FLA.

PASE PO.				
_		GE-033585	пин но. 15	
	+59	MIL-J-5161F Grade 1	THE EPTINE STARTED 0810	
	MIL-1-7808F	NO. LES. OF OIL USED DURING RUN	0812	
	+79°F	RELATIVE HUMBOITY \$	TOTAL TIME OF RUN :02	
PRIGR TO SYART		Maximum Cranking RPM	TOTAL TIME ON ENGINE :40	
MM 10.5 SEC	5100 mpm MM 30 sec	MAK TPT DURING START 980 *	rest observer Cardwell	
2 MM 23 MGC		فينيا والبنيية فيلفنا التبرين المانات المساولات المستكالات والمتبارات	30.11" Hga	
RPM		REMARKS		
0	The engine fired at peak fuel flow was 1 pressure was 850 psightern time was approx	l flow. The r breach psig. The was not an		
	SC st 1967 ED PRIGR TO SYARY MMN 10.5 SEC 2 MMN 23 SEC RPM	St 1967 St 1967 St 1967 St 1967 St 1967 St 1967 St 1967 St 1967 St 1967 St 1968 St	St 1967	

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Ay-Egles Ayb, Fla

		OBSERVER'S LOG		PAGE NO.	
JET ENGINE MOD	JET ENGING MODEL ENGINE SERIAL NO.				
J79-GE-5C			GE- 033585	16	
PATE		TEST TEMPERATURE (8p)	TPUZE	THE ENGINE STARTED	
18 Augus	t 1967	0	MIL-J-5161F Grade 1	0803	
FUEL SYSTEM US	20	LUST OIL ERADE	NO. LES. OF OIL USER SURING NUN	THE ENSINE STOPPED	
Normal.		MIL-1-7808F		0805	
POTARS TEST		BAR. TEMPERAYURE	BELATING PURDITY %	TOTAL TREE OF ROW	
GOWET		+78°F		:02	
2	MICH TO PTART	PT CES EMERIC AWAY TORROR	мохици спанхіня пон	:42	
20		TIME TO REACH		TEST ORSENVER	
Time to Fire	15.2 sec	5000 RDM NEW 48 STC	MAN TOT DURING START 830	Cardyall	
		PUNPOSE OF RUM		BAR, READING	
RUH DOWN THE	1 MAN 62 SEC	To obtain date at 0°	F	30~08:Hga	
Thir	RPM		REMARKS		
0805	5100	peak fuel flow was 1950 pph. The starter air pressure was 41 psig and starter switch was cut out manually at 3000 rpm and 37 seconds. The peak air temp before the starter air valve was 285°F. Shut down.			

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APGC STEP 83 0-332

AF-EGLDI AFB, PLA.

		OBSERVER'S LOG		PASE NO.
JET ENGINE GOD!	I C	ENSINE SERIAL N	RUN HO.	
J79-GE-5		TEOT YEIGHERATURE (*P)	GE-033585	17
21 Augus		0	MIL-J-5161F Grade 1	0811
FUEL SYSTEM US: Normal	10	LUBE OIL SHADE MIL-L-7808F	NG. LBS. OF GIL USED DURING RUN	TIME ENGINE STOPPED 0813
YEST OPERATOR		BAR, TEMPERATURE	RELATIVE HUMOITY \$	TOTAL TIME OF NUN
Gower		+80°F		:02
HAS COLD SOAR	RION YO START	EUDNOT YAWA HABRE UPL TY	MAXIMUM CHANXING RPM	Toyal True on Engine
72		THE TO REACH-		:44 TEST OBSERVER
TIME TO FIRE	ын ₁₇ вес	000 RPM MN 52 SEC	MAX TPT DURING START 920	Cardwell
RUN DOWN TRAE	1 MM 42 SEC	To obtain starting de	ta at 0°F.	29.85" Hge
TIME	RPH		REMARKS	
0813	5100		ak air temp before the a witch was cut out manual	

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AT-ROLIN AFB, PLA.

		OBSERVER'S LOG		PAGE NO.	
JET KHOINE MODI	ri.	BHSINE SHIPL H		MUM NO.	
J79-GE-5	C		g-033585	18	
22 Augus		0			
PUZL SYSTEM USI Nozwal	to	LUGE OIL GRASE MIL-1-7808P	NO. LBS. OF OIL USED DUNING NUN	11ME ENGINE STOPPED	
TEST OPERATOR		BAR, TEMPERATURE	RELATIVE HUMBITY &	TOTAL TIME OF RUN	
Gower		+82°F		:02	
HRS COLD SOAR S	PRIOR YOUSTART	PT LEG BREAK AWAY TORQUE	Marierm Chanking RPM	TOTAL TIME ON ENGINE	
Time to Pire	*** 13.3*EC	2000 DBM 100 - 255	HAX TPT DURING START 810 F	resy observen Cardwell	
жит икоб кил	1 Ham 42 FEC	PUNPOSE OF RUN To obtain data at 0°F	•	29.87"Hg &	
TIME	RPM		REMARKS		
0904	0	The engine fired at 1100 rpm with 750 pph fuel flow. The peak fuel flow was 1875 pph. The starter air pressure was 41 psig and peak air temp. before the air valve was 260°F. The starter switch was cut out manually at 3000 rpm and 38 seconds.			
0906	5040	Shut down.			

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Ay-eglih ayb, yla.

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				PAGE NO.	
OBSERVER'S LOC			1		
JET ENGINE MODI		engiki serial n	o. GE-033585	яин но. 19	
J79-G8-5	~~~	TEST TEMPERATURE (P)	Post	TIME ENGINE STARVED	
23 Augus	t 1967	O	MIL-J-5161F Grade 1		
		MIL-L-7808F			
Normal TEST OFERATOR		MIL-L-7808F 0808 BAR. TEMPERATURE RELAYIVE HUMINATOR VOYAL TIME OF RUN			
COMBY		+88°P		:01	
	PRIOR TO START	PT LSS SREAK AWAY TORQUE	Maxique Crancing RPM	TOTAL TIME ON ENGINE :47	
23		TIME TO REACH		TEST COSERVER	
TIME TO FIRE	11.8 SEC	5100 HPM MRM 398EC	MAX TPT DURING START 835	Cardwall	
RUN DOWN TROE	MW SEC	PURPOSE OF RUS		BAR, READING	
TIME	1 29 RPH	To obtain starting da	ta at O'F.	29.93" Hga	
11000	NPH .		REMARKS		
			OL-10-94 hatch no. B2900 is a MXU-4A/A cartridge.		
0807	© .	The engine fired at 1220 rpm with 720 pph fuel flow. The peak fuel flow was 1920 pph. The average breech pressure was approx 790 psig with burn out at 19 reconds. The highest breech pressure occurred just prior to burn out at 810 psig. The throttle was pre-set prior to start initiation.			
		Shut down.			
		SACRE AND ADDRESS OF THE SACRE AND ADDRESS OF			

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AF-EGLIN AFE, FLA.

		OBSERVER'S LOG		PAGE NO.
JET ENGINE MODI	ri.	EMBINE SERIAL N		NUN HO.
J79-GE-5	C		GE- 033585	20
24 Augus		C C C C C C C C C C C C C C C C C C C	MIL-J-5161F Grade 1	TIME ENGINE STARTED 1335
FURL SYSTEM US: Normal	t D	LUBE OIL GRADE MIL-L-7808F	NO. 1,88. OF GIL USED DURING RUN	TIME ENGINE STOPPED 1336
TEST OPERATOR		BAR, TEMPERATURE	RELATIVE HUMBSITY S	TOTAL TIME OF RUN
GOWET		+34°F		;01
29	PRIOR TO STARY		isdensing RPM	TOTAL TIME ON EHRINE :48
TIME TO FIRE	ми 8.8 вес	THE TO REACH- 5000 RPM MIN 34 EEC PURFORE OF RUN	MAX TOT DURING START 795 **	rest ossenven Cardwell
RUH DOWN TIME	1 MM 39*EC	To obtain starting de	its at 0°F.	30.00" Hga
TIME	RPM		REMARKS	
1335	0	HOTE: Cartridge lot OL-6-463 batch no. B95D-10 scaked 30 hrs at 0°F. Cartridge type MXU-4/A. The engine fired at 1080 rpm with 760 pph fuel flow. The peak fuel flow was 1830 pph. The peak starter breach pressure was 910 psig with average pressure from 775 to 800 psig. Burn time was approx 19 seconds. The peak pressure occurred just after cartridge fired. The throttle was pre-set.		
1336	5080	Shut down.		

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AF-BOLIN APB, PLA.

		OBSERVE	E'S LOG		PAGE HO.
SHY THRUT MAN	RT ENGINE MODEL GREINE SERIAL HO.			RUN HO.	
J79-GE-5			A JAINSE SAIRE	GE- 033585	21
DAYE		TEST TEMPERATU	ME (F)	Puz.	YEAR ENGINE STARTED
25 Augus		0	-	MIL-J-5151F Grade 1	0838
PURL SYSTEM US	to	LUCE OIL STADE) es	NO. LOS. OF OIL USED DUNING RUN	TIME ENGINE STOPPED 0839
Normal Test openation		MIL-L-7808		RELATIVE HUMDITY %	TOTAL TIME OF MUN
Gowar		+80°F	~~	REATIVE NOMBITY 9,	:01
HES COLD SOAK	TRATE OF ROIS	FY LES BREAK AS	AY YORQUE	MAXIATUM CRANKING RPM	TOTAL TIME ON ENGINE
19					:49
TIME TO FIRE	MH 9.3*EC	TIME TO REACH	мн 35 якс	MAX TPT DURING START 740 0	rest obsenven Cardwell
		FURFOSE OF RUN	мн 35 якс	1	BAR. READING
ZWIT KWOO KUN	1 MIN 34 SEC				30.00" Hga
TIME	RPH			REMARKS	
0838	0	hrs at 0°1 The engine peak fuel pressure to the average to the pressure to the average to the average to the terms of the average to the ave	NOTE: Cartridge lot 01-6-463 batch no. B95D-3 hrs at 0°F. Cartridge type MXU-4/A. The engine fired at 1080 rpm with 720 pph fuel peak fuel flow was 1910 pph. The peak starter pressure was 910 psig just after the cartridge The average pressure was 810 psig with burn of 18 seconds. The throttle was pre-set.		
0839	5080	Shut down.			
APGC FOR		L	ing parajoration Appropria		AF-EGLIN AFO, FLA.

APGC PORM 0-332

AF-EGLIN APO, PLA

		OBSERVER'S LOG		PAGE NO.
JET ENGINE MOO		ENGINE SERIAL	40.	RUH HO.
179-GR-5	c		00	
DATE	179-GR-5C GE-033585			72 TIME ENGINE STARTED
28 Augus	t 1967	Amb. +75°F	MIL-J-5161F Grade 1	1049
FUEL SYSTEM US	E O	LUSE OIL GRADE	NO. LES. OF OIL USED DURING TUN	TIME ENVINE STOPPED
Normal		MIL-1-7808F		1054
TEST OPERATOR		BAR, TEMPERATURE	RELATIVE HUMBITY %	TOTAL TIME OF NUN
HAS COLD SOAK	PRICE TO START	FT LES BREAK AWAY TORQUE	MARINUM CRANKING RPM	:05
				:54
None		TIME TO REACH-		TEST OBSERVER
TIME TO FIRE	15.5	5000 RPM MH 51 BEC	MAX TPT DUNING START 1140 P	Goolsby
		PURPOSE OF RUN		BAR, READING
RUN DOWN TIME	2 MM 301EC	To remove moisture fo	rom engine.	30.03" Hga
TIME	RPM		REMARKS	
1049	0	NOTE: The engine has been subjected to high humidity since the last run at 0°F and this run is being made to dry the engine before lowering the temperature to -20°F. Starter on: The engine fired at 1100 rpm with a fuel flow of 685 pph and a peak fuel flow of 1830 pph. The starter air pressure was 36 psig and starter air temperature was 360°F. The start switch was released at 3000 rpm in 39 seconds.		
1054	5100	Shut down.		

APGC 25 SKP 81 0-332

AV-EQUEN AVE, FLA.

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J79-GE-5C GE-033585 23 DAYE 29 August 1967 -20°F MIL-J-5161F Grade 1 0809 FUEL SYSTEM USED NOTES 1 WILL-T-7808F WILL-T-7808F WILL-T-7808F HELATIVE HUMBDITY \$ 102 HANDERAVURE 82°F HELATIVE HUMBDITY \$ 102 HANDERAVURE 11 TIME TO HER MIN 16 SEC RUM DSH THEE 2 MIN 29 SEC TIME TO Obtain starting data at -20°F. THE TO Obtain starting data at -20°F. THE START OF THE START ST				1
### PAPER OF PRIOR TO STARY TIME TO FIRE #### APP ### PAPER OF PRIOR TO STARY TIME TO FIRE ###################################	J79-GZ-5C		GE- 033585	23
Normal WIL-L-7808F SAR. TEMPERATURE BAR. TEMPERATURE CO2 WAXINGUM CHARKING RPM TO THE TO HEAGH- 5000 RPM MIN 85 SEC MAN TPT DURING START 760 PP GOOLSBY FURPOSE OF RUN TIME REMARKS O809 O Starter on: The engine fired at 1050 rpm and a fuel flow at fire of 740 pph and a peak fuel flow of 1900 pph. The starter air valve was approx 4 seconds in opening after start switch was turned on. The starter air pressure was 38 psig and starter air temperature was 283°F. The start switch was released in 64 seconds at 3000 rpm.	29 August 1967	-20°F	MIL-J-5161F Grade 1	0809
SAR. TEMPERATURE 82°F HRS COLD SOAR PRIOR TO START 11 TIME TO FIRE MAN 16 SEC COOR RPM MN 85 SEC MAN TPT DIWING START TO OBSERVER TO OBTAIN START O OBTAIN TO OBTAIN START TO OBTAIN SAR. READING 30.02" Hga REMARKS 0809 O Starter on: The engine fired at 1050 rpm and a fuel flow at fire of 740 pph and a peak fuel flow of 1900 pph. The starter air valve was approx 4 seconds in opening after start switch was turned on. The starter air pressure was 38 psig and starter air temperature was 283°F. The start switch was released in 64 seconds at 3000 rpm.		•	NO. LES. OF OIL USED DURING RUN	1 . 2
TIME TO HEAGH- TO Obtain Starting data at -20°F. TIME TO PIME TO Obtain Starting data at -20°F. TIME RPM Starter on: The engine fired at 1050 rpm and a fuel flow at fire of 740 pph and a peak fuel flow of 1900 pph. The starter air valve was approx 4 seconds in opening after start switch was released in 64 seconds at 3000 rpm.	TEST OPERATOR	gar. Temperature	HELATIVE HUMBITY \$,
TIME TO HEAGH- TO DEAN TIME 2 MAN 16 SEC 5000 RPM MN 85 SEC MAN THE DIWINE START 760 P Goolsby PURPOSE OF RUN TIME 70 Obtain Starting data at -20°F. 30.02" Hga REMARKS O809 O Starter on: The engine fired at 1050 rpm and a fuel flow at fire of 740 pph and a peak fuel flow of 1900 pph. The starter air valve was approx 4 seconds in opening after start switch was turned on. The starter air pressure was 38 psig and starter air temperature was 283°F. The start switch was released in 64 seconds at 3000 rpm.		1		
TIME OF THE NEW 16 SEC 5000 RPM MIN 85 SEC MAR THE DIWINE START 760 P GOOLSby PURPOSE OF RUN TO obtain starting data at -20°F. 30.02" Hga REMARKS O809 O Starter on: The engine fired at 1050 rpm and a fuel flow at fire of 740 pph and a peak fuel flow of 1900 pph. The starter air valve was approx 4 seconds in opening after start switch was turned on. The starter air pressure was 38 psig and starter air temperature was 283°F. The start switch was released in 64 seconds at 3000 rpm.			MAXIMUM CHANKING RFM	:56
Time RPM REMARKS O809 O Starter on: The engine fired at 1050 rpm and a fuel flow at fire of 740 pph and a peak fuel flow of 1900 pph. The starter air valve was approx 4 seconds in opening after start switch was turned on. The starter air pressure was 38 psig and starter air temperature was 280°F. The start switch was released in 64 seconds at 3000 rpm.	TIME TO FIRE MIN 16 SEC	5000 RPM MN 85 SEC	MAN TOT DURING START 760 P	Goolsby
O809 OStarter on: The engine fired at 1050 rpm and a fuel flow at fire of 740 pph and a peak fuel flow of 1900 pph. The starter air valve was approx 4 seconds in opening after start switch was turned on. The starter air pressure was 38 psig and starter air temperature was 283°F. The start switch was released in 64 seconds at 3000 rpm.	RUN D. SN TIME 2 MIN 29 BE		uta at -20°F.	5 · · · · · · · · · · · · · · · · · · ·
at fire of 740 pph and a peak fuel flow of 1900 pph. The starter air valve was approx 4 seconds in opening after start switch was turned on. The starter air pressure was 38 psig and starter air temperature was 283°F. The start switch was released in 64 seconds at 3000 rpm.			الماليات المراقع في المراقع المراقع المراقع المراقع المراقع المراقع المراقع المراقع المراقع المراقع المراقع ال	
0811 5040 Shut down.		at fire of 740 pph and a peak fuel flow of 1900 pph. The starter air valve was approx 4 seconds in opening after start switch was turned on. The starter air pressure was 38 psig and starter air temperature was 283°F. The start		
	0811 30&0	Sauce down.	•	

APGC , FORM , 0-932

AF-EQLIN AFB, PLA.

		OBSERVER'S LOG		PAGE NO.	
JET ENGINE MOD	GINE MODEL ENSINE SERIAL NO.				
			GE-033585	RUN NO. 24	
179eGR-5	L	TEST TEMPERATURE (PF)	FUEL FUEL	TIME ENGINE STARTED	
30 Augua	t 1967	-20°F	MIL-J-5161F Grade 1	0928	
FUEL SYSTEM US		LURE OIL ERADE	NO. LES. OF OIL USED DURING RUN	TIME ENGINE STOPPED	
Normal		MIL-I-7080F		0930	
TEST OPERATOR		BAR. TEMPERATURE	RELA IE HUMBDITY %	TOTAL TIME OF RUN	
Gower:		86°F		:02	
	PRIOR YO START	FY LES BREAK AWAY TORQUE	MAXIMUM CRANKING RPM	TOTAL TIME ON EKGIN	
13		TIME TO REACH-	258		
TIME TO FIRE	MIN 12.8*EC	5000 RPM MN 35 SEC	Goolsby		
RUN DOWN TIME	2 MIN 30 SEC	FURPOSE OF RUN To obtain starting d	29.96" Hga		
TIME	RPM		REMARKS		
0928	0	start procedure used in making a cartridge start). Starter on: The engine fired at 1070 rpm with 700 pph fuel flow and a peak fuel flow of 1880 pph. The starter air pressure was 41 psig at 300°F. The start switch was released at 66 seconds at 3000 rpm. There was a 3 second delay in the opening of the air valve.			
0930	5040	Shut down.			

APGC . FORM 0-332

Ay-rolin Apb, Pla.

		OBSERVER'S LOG	April Maria Maria Maria Maria Maria Maria Maria Maria Maria Maria Maria Maria Maria Maria Maria Maria Maria Ma	PAGE NO.	
JET ENGINE MOO	RUP KO.				
J79-G8-5		ensine berial	GE-033585	25	
31 August 1967		-20°F	MIL-J-5161F Grade 1	TIME ENGINE STAIL, _D 0817	
Puel system us Normal	50	LUGE OIL ERADE MIL-L-7808F	NO, LEE, OF CAL USED BURING NUM	71MK KH6IME 970P980 0819	
VEST OPERATOR		BAR. TEMPERATURE	RELATIVE HUMBOITY %	TOTAL TIME OF RUN	
GOWAZ		PT LOS LABAS LLLY TORQUE	MAXIMUM CRANRING RPM	102	
15	PRIOR TOSTANT		THE STATE OF THE S	1:00	
TIME TO FIRE MIN 11 SEC		TIME TO REACH- 5000 RPM MM 77 SEC	MAR TET JURING START 660 P	TEST OSSERVER GOOLSby	
RUN DOWN TIME	1 MCH 30 SEC	PURPOSE OF RUE To obtain starting d	29.97" Hga		
TIME	R P M		KIHARKS		
0805	0	NOTE: Cartridge lot OL-6-463 batch no. B95C-4 soaked 24 hrs at -20°F. Cartridge type MXU-4/A. Starter on: The cartridge did not fire. The circuit was checked and found to be good. The contacts were re-cleaned. 2nd Attempt:			
0817	v	Starter on: The engine light off occurred at 100 rpm with 710 pph fuel flow. The peak fuel flow was 2000 pph. The peak starter breech pressure was 925 psig and occurred at the start of the burn cycle. The average breech pressure was 750 psig. The cartridge burned out at 2375 rpm in approx 22 seconds.			
0819	5040	Shut down.			

APGC PORH 0-332

AF-EGLIN AFB, FLA.

-		OBSERVER'S LOG	-	PAGE NO. 1		
JET ENGINE MOD	ži.	ENGINE SERIAL	. NO.	RUN HO.		
J79-GE-5	C	l	GE-033585	26		
DATE		TEST TEMPERATURE (FF)	FUEL	TIME CHUINE STARTED		
	ber 1967	-20°F	MIL-J-5161F Grade 1	0812		
FUEL SYSTEM US	KO	LUBE OIL SHADE	NO. LES, OF OIL WED DURING RUN	TIME ENGINE STOPPED		
Normal	NOTES MIL-L-7808P					
	TOPERATOR BAR. TEMPERATURE RELATIVE HUMDITY % GOWER 76°F					
	GOWER /D F S COLD SOAK PRIOR TO START FT LES EREAK AWAY TORQUE MAXIMUM CRAMKING RPM					
16	Alon Toblant	, , , , , , , , , , , , , , , , , , , ,		TOTAL TIME ON ENGINE 1:02		
		THE TO REACH	TEST OBSERVER			
TIMI: TO FIRE	MIH 11 SEC	MAX TPT DURING START 630	Goolsby			
		PURPOSE OF RUN	BAR. REFSING			
MUN DOWN TIME	1 MIN 28 SEC	To obtain start dat	30.02" Hga			
TIME	RPM		REMARKS			
		B-58 piping from the valve to the starter was removed. The air line from the MA-2 is connected directly to the starter and the air valve on the MA-2 will be used to control the air to the starter. The throttle will be pre-set prior to engaging to start switch.				
0812	0	Starter on: The engine fired at 1120 rpm with 700 pph fuel flow. The peak fuel flow was 1875 pph. The start switch was released at 3000 rpm in 61 seconds. The starter air pressure was 53 psig and starter air temperature was 280°F.				
0814	5040	Shut down.				
			e leakage was checked duri e until the engine was shu			

	OBSERVER'S LOG		PAGE NO.		
JET ENGINE MODEL	ENGINE SPRIAL N	O.	RUN NO.		
J79-GE-5C Engine	GE-033585		02		
DAYS	TEST TEMPERATURE (0P)	FUEL	TIME ENGINE STARTED		
8 September 1967	Outside Air	MIL-J-5161F Grade 1	1330		
FUEL SYSTEM USED	LUBE OIL SRADE	NO, LOS. OF OIL WED DURING HUN	TIME ENGINE STOPPED		
Normal	MIL-L-7808F		1334		
TRST OPERATOR	BAR. TEMPERATURE	RELATIVE HUMDITY &	TOTAL TIME OF RUN		
Gowar	+80°F		:04		
HRS COLD SOAK PRIOR TO START	FT LES BREAK AWAY TORQUE	MAXIMUM CRANKING MPM	TOTAL TIME ON ENGINE		
			1:06		
TIME TO FIRE MIN SEC	TIME TO REACH-		TEST OBSERVER		
TIME TO FIRE MIN SEC	5100 яэм мя 49 вес	MAX TPT DURING START 1090	Cardwell		
RUN DOWN TIME A MIN CA SEC					
2 02	To check engine sites	To check engine after fuel control change.			
TIME RPM		REMARKS			
1313 O	Fuel control P/N 4044 control has been mode counteract shift tower and to reduce rumble. The starter air valve the starter has been wet pre-start. The maximum cranking 700 pph. The starter	e and the B-58 piping from installed. speed was 1320 rpm and r air pressure was 36 ps	i. The fuel or Co. to d temperatures om the valve to fuel flow was ig.		
1330 0	The engine fired at 1200 rpm with 650 pph fuel flow. The peak fuel flow was 1905 pph. The average starter air pressure was 37½ psig with a peak air temp before the yalve of 417°F. The starter switch was cut manually at 3000 rpm and 37 seconds.				
1334 5120	Shut down.				

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AF-EGLIN AFB, FLA.

9

	. —	OBSERVER'S LOG		PAGE NO.		
ET ENGINE CHOO	EL	RUN HO,				
J79-GE-5	GE-033585	28				
ATE		TEST TEMPERATURE (UP)	ruse	TIME ENGINE STARTED		
8 Spotemus	ber 1967	MIL-J-5161F Grade 1	1356			
UEL SYSTEM US	ro .	LUBE OIL SUADE	HO, LES. OF OIL USED DURING RUN			
Normal		MIL-17808F		1358		
test operator		DAR, TEMPETATURE	RELATIVE HUMBITY % TOTAL TIME OF RUN			
GOVAT		+78°F	202 IQUE MARIMUM GRANKINA RPM TOTAL TIME ON CHEINI			
INS COLD SUAR	PRIOR TO START	PT LES ENEAR AWAY TORQUE	BREAK AWAY TORQUE MAXIMUM CRANKINS RPM TOTAL TIME ON G 1:08			
		TIME TO REACH-	LIUD TEST OBEZNYER			
TIME TO FIRE	MIN 40 SEC		MAX TPT DURING START 1150	Cardwell		
7-0	12.8	5100 RPM MH 42 SEC	1130	BAR, READING		
NUT HWOO NUF	2. MH 44 BEC	To obtain starting	da tra	29.90" Hgs		
TIME	RPM	10 Opto 711, Pakitalik.	REMARKS	27.70 15.5		
- 1,000			***************************************			
1356	0	peak fuel flow was to 38 psig and starter peak starter air te	1140 rpm with 630 pph fue 2000 pph. The starter air was cut out at 3000 at 38 peratura was 390°F.	: pressure was		
1358	5180	Shut down.				

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AF-EGLIN AFB, FLA.

		OBSERVER'S LOG		PAGE NO.		
JET ENSINE MOO	KL	ENSINE SEATAL	NO.	RUH NO.		
J79-GE-5	C		GE~033585	29		
DATE		TEST TEMPERATURE (PF)	FUEL	TIME RHOINE STARYED		
	ber 1967	-20°F	MIL-J-5161F Grade 1	1406		
FUEL SYSTEM US	EO	LUSE OIL SHADE	NO. LOS. OF OIL WED DURING RUN	TIME ENGINE STOPPED		
Normal		MIL-L-7808F		1408		
TEST OPERATOR		AR. TEMPERATURE 475°P	RELATIVE HUMBOITY &	TOTAL TIME OF RUN		
Gowar				:02		
HES COLD SOAN Total Sc		FT LOS BREAK AWAY TORQUE	MAXIMUM CRANKING RPM	TOTAL TIME ON ENGIN		
TOCET OF	149- ZA	TIME TO REACH	1:10			
TIME TO FIRE	MM 14.2 SEC		MAX TPT DURING STARY 765	1		
	14.2	SOGO REM MN 54 SEC	765	Cardwell		
BUIT HWOO HUR	1 MIN 30 SEC	To obtain starting	29.81" Hga			
TIME	SPM		REMARKS	1 47.01 EX		
1184	15 7 10					
		NOTE: The main fue	1 control CDP reference di	rain line		
		disconnected on run	no. 8 has been connected	for normal		
		configuration.				
	Į.	_				
1406	0	The engine fired at	1180 rpm with 650 pph fu	al flow. The		
		peak fuel flow was 1980 pph. There was an approximate delay of 3 seconds in starter air valve opening. The average air pressure was 47 psig and peak air temperature				
		before the valve wa	s 286°F. The starter swi	tch was manually		
		cut out at 3000 rpm and 42 seconds.				
1408	5060	Shut down.				
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APGC 25 SEP \$3 0-332

AF-EGLIN AFB, FLA.

JET ENGIME MODEL		observers los				
	EMPINE SKIPLE		RUN NO.			
J79 - GE-5C		TEST TEMPHRATURE (PP)	CE-033585	30		
	10 September 1967 -20°F MIL-J-5161F Grade 1					
PUEL SYSTEM USED Normal						
TEST OPERATOR		BAR, TEMPERATURE	TOTAL TIME OF NUN			
GOWER		+78°F	:02 TOTAL TIME ON ENGINE			
23 3/4	START		1:12			
TIME TO FIRE MIN 12	2,5***	TIME TO REACH. 5060 _{rpm} mn 52 _{dec}	060 NPM MN 52 ORC MAR TPT DISRING START 745 47			
RUN DOWN THE 1 MIN	27***	To obtain scarting d	eta at -20°F.	Dan, Rizazine 29.88" Her		
TIME R	PM		REMARKS			
1405	0	NOTE: Cartridge lot 01-6-463 batch no. B95C-451 soaked 25 3/4 hrs at -20°F. Cartridge type MXU-4/A. The engine fired at 1200 rpm with 550 pph fuel flow. The peak fuel flow was 1950 pph. There was a delay in beech pressure indication. Speed began to increase before there was an indication of breech pressure. The breech pressure was approx 800 psig.				
1407 50	60	excessive during the	rom the P&D valve appeared start.			

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Ay-EGLIX AFB, FLA.

····			PAGE NO.	
	observer's log		1	
EL	ENJIM, SERIAL	. NO,	RUN HO,	
5C		3E-033585	31	
	Į ·	1	TIME ENGINE STARTED	
1967			0805	
PEO		INO. LOS. OF OIL USED DURING RUN		
		BELATIVE HUNDITY &	0807	
]		:02	
PRIOR TO START	PT LOS BREAK ANAY TORQUE	MAXIMUM CHANKING RPM	TOTAL TIME ON ENSINE	
oak 18 hrs.			1:14	
40M 475	TIME TO REACH-	MAY 200 DIGING 57405	TEST OBSERVER	
21.5		720	Cardwell	
. MAN SEC	PURPOSE OF RUN	_	BAR, READING	
	To obtaîn data at -2		29.99" Hga	
RPM		REMARKS		
0	to the starter has been removed. The MA-2 air line connects to the starter with the MA-2 valve controlling air pressure. The engine fired at 1200 rpm with 650 pph fuel flow. The peak fuel flow was 1950 pph. The starter air pressure was 53 psig with a peak temperature of 267°F. The starter switch was cut manually at 32 seconds and 3000 rpm. The P&D drain valve leakage appeared to be excessive on the previous run so the drain line was solenoid closed for this			
5060	Shut down.			
	0 O	TEST TEMPERATURE (F) -20°F LUBE OIL GRADE MIL-L-7808F BARL TEMPERATURE +76°F PRIOR TO START OAK 18 hrs. THE BREAK ADAY TORQUE THE TO REACH- 5060 RPM MM 42 SE PURPOSE OF RUN TO obtain data at -2 RPM NOTE: The starter at to the starter has be to the starter with The engine fired at peak fuel flow was 1 53 psig with a peak was cut manually at The PED drain valve previous run so the start.	TEST TEMPERATURE (PF) 1967 -20°P LUBE OIL GRADE MIL-L-7808F SAR. TEMPERATURE 476°F PRIOR TO START Oak 18 hrs. MIN 11.5 SEC 1960 RPM MIN 21.5 SEC SOGO RPM MIN 42 SEC MAX TPT DURING START 720°P PURPOSE OF RUN TO obtain data at -20°F. RPM NOTE: The starter air valve and R-58 piping if to the starter has been removed. The MA-2 air to the starter with the MA-2 valve controlling The engine fired at 1200 rpm with 650 pph fuel peak fuel flow was 1950 pph. The starter air 53 psig with a peak temperature of 267°F. The was cut manually at 32 seconds and 3000 rpm. The P&D drain valve leskage appeared to be exprevious run so the drain line was solenoid classer.	

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AF-BOLDI AFE, FLA.

		OBSEZVER	s LOG		PASE NO.
JUT EMPINE MODEL EMPINE MERIAL MO.					nun no.
J79-GE-5				GE-033585	32
DATE		TRUT TEMPERATUR	* () ()	FUEL	THE ENGINE STARTED
12 Sept	1967	-40°F		MIL-J-5161F Grade 1	0814
FUEL SYSTEM US	zo.	LUGE OIL GRADE		NO. LOS. OF OIL USED DURING RUN	
Normal		MIL-L-7808F	0815		
Gover	,	TOTAL TIME OF RUN 101			
HRS COLD SOAK	RIOR TO START	+74°F PT LOS BREAK AWA	y Tongus	MARIMUM CRANKING RPM	TOTAL THE ON ENSINE
213					1:15
TIME TO FIRE MIN SEC		THE TO REACH-		MAX TOT DIMINE START OF	TEST OBSERVER
	13.5 5000 RPM MM 53 SEC MAN TPT DURING START 750 TPURPOSE OF RUH		Cardvell		
пин роян тыс	1 MH 10 SEC	To obtain d	ere er -40°	P 17	30.03" Hgs
TIME	RPM	TO ODEATH C	9 C 9 C	REMARKS	1 DU.UJ Dge
					
		NOTE: Cartridge lot OL-6-463 batch no. B95C-453 soaked 21½ hrs at -40°F. Cartridge type MXU-4/A.			
0814	0	The engine fired at 1160 rpm with 630 pph fuel flow. The peak fuel flow was 1950 pph. The peak starter breech pressure was 950 psig and overage pressure was approx 785 psig. The burn time was approximate 21 seconds.			
		NOTE: The P&D valve drain line was solenoid closed for the start, and will remain closed on subsequent starts, being opened after reaching idle speed.			
0815	<i>5</i> 050	Shut down.			
				11 leak around the pump, ed. Laukage amounted to	
[l			

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A7-EGLIH AYB, YLA.

M SEC	The engine fired at fuel flow was 1968 p with a peak temperat manually cut out at Shut down. NOTE: There was no	MIL-J-5161F Grade 1 MIL-J-5161F Grade 1 MO. LOW OF OIL WARD DUMING RUM MAX THE DUMING START 640 REMARKS be used for this start. 1260 rpm with 630 pph fuelph. The starter air pressure of 282°F. The starter 3000 rpm and 29 seconds. oil leakage noted on this may have been due to high	OB52 TOTAL TAME OF SUM 201 TOTAL TAME ON EMSINE 1:16 TEST OPSERVER Cardwell SAR READINS 30.03" Hga 1 flow. The peak Sure was 57½ psig r switch was Tun. The leak
TOSTARY N 11 SEC OMM 22 SEC S3 P M	TEST TEMPERATURE (PF) -40°F LUBE ON ERADE MIL-1-7898F BAR THE TERRITURE +75°F FT 148 SHEAR ANAY TORSING THE TO SEACH 5000 APM ANN 39 SEC FUNTOSE OF SUN To check oil leakage NOTE: The MA-2 will The engine fired at fuel flow was 1968 p with a peak temperaturally cut out at in Shut down. NOTE: There was no on the previous run:	MIL-J-5161F Grade 1 MIL-J-5161F Grade 1 MO. LOW OF OIL WARD DUMING RUM MAX THE DUMING START 640 REMARKS be used for this start. 1260 rpm with 630 pph fuelph. The starter air pressure of 282°F. The starter 3000 rpm and 29 seconds. oil leakage noted on this may have been due to high	33 TIME EMBINZ STANSED 0851 TIME EMBINE STOPPED 0852 TOYAL TIME ON EMBINE 1:16 TEST DESERVER Cardwell BAR READINS 30.03" Hga 1 flow. The peak Sure was 57½ psig r switch was Tun. The leak
TOSTARY N 11 SEC OMM 22 SEC S3 P M	-40°F LUCK ONL SHADE MIL-1-7898F BAR THACKBATUME +75°F FT 148 SHEAR ANAY TORSON THE TO HEACH 5000 SPM ANN 39 SEC FUNTOSE OF SUN To check oil leakage NOTE: The MA-2 will The engine fired at fuel flow was 1968 p with a peak temperate manually cut out at : Shut down. NOTE: There was no on the previous run:	MIL-J-5161F Grade 1 MO. LTA. OF OIL LORD DUMING RUM MELATIVE MUNICIPE E MAX TOT DURING START 640 REMARKS be used for this start. 1280 rpm with 630 pjh fuelph. The starter air pressure of 282°F. The starter 3000 rpm and 29 seconds. poil leakage noted on this may have been due to high	O851 TIME EMBINE STOPED O852 TOTAL TAME ON EMBINE 1:16 TEST OFFERVER Cardwell BAN. READINS 30.03" Hga 1 flow. The peak Sure was 57½ psig r switch was Tun. The leak
TOSTARY N 11 SEC OMM 22 SEC S3 P M	MIL-1-7898F **********************************	BENARKS be used for this start. 1280 rpm with 630 pjh fuelph. The starter air pressure of 282°F. The starter 3000 rpm and 29 seconds.	OS52 TOTAL TAME OF PUN :01 TOTAL TAME ON EMSINE 1:16 TEST OFFERVER Cardwell SAN. READINS 30.03" Hga 1 flow. The peak Sure was 57½ psig r switch was Tun. The leak
TOSTARY N 11 SEC OMM 22 SEC S3 P M	MIL-1-7898F **********************************	BENARKS be used for this start. 1280 rpm with 630 pjh fuelph. The starter air pressure of 282°F. The starter 3000 rpm and 29 seconds.	OS52 TOTAL TAME OF PUN :01 TOTAL TAME ON EMSINE 1:16 TEST OFFERVER Cardwell SAN. READINS 30.03" Hga 1 flow. The peak Sure was 57½ psig r switch was Tun. The leak
# 11 SEC 11 SEC 11 SEC 12 SEC 13 PM	+75°P FT 100 SMEAR ANALY TORSION THE TO MEACH 5000 SPM MM 39 SEC FUNDOSE OF SUN To check oil leakage NOTE: The MA-2 will The engine fired at fuel flow was 1968 p with a peak temperate manually cut out at fuel flow. NOTE: There was no on the previous run:	BENARKS be used for this start. 1280 rpm with 630 pph fuelph. The starter air pressure of 282°F. The starter 3000 rpm and 29 seconds.	107AL TAME OF MUN 201 TOTAL TAME ON EMSINE 1:16 TEST OFSERVER Cardwell BAN READINS 30.03" Hga 1 flow. The peak Sure was 57½ psig r switch was Tun. The leak
# 11 SEC 11 SEC 11 SEC 12 SEC 13 PM	+75°P FT 100 SMEAR ANALY TORSION THE TO MEACH 5000 SPM MM 39 SEC FUNDOSE OF SUN To check oil leakage NOTE: The MA-2 will The engine fired at fuel flow was 1968 p with a peak temperate manually cut out at fuel flow. NOTE: There was no on the previous run:	MAX *** DIMING START 640 ** **EMARKS** be used for this start. 1280 rpm with 630 pph fuelph. The starter air pressure of 282°F. The starter 3000 rpm and 29 seconds. oil leakage noted on this may have been due to high	:01 TOTAL THE ON EMSINE 1:16 TEST OFSERVER Cardwell SAR READINS 30.03" Hga 1 flow. The peak Sure was 57½ psig r switch was Tun. The leak
# 11 SEC 11 SEC 11 SEC 12 SEC 13 PM	THE TO MEACH 5000 APM MM 39 SEC FUNDOSE OF AUN To check oil leakage NOTE: The MA-2 will The engine fired at 1 fuel flow was 1968 p with a peak temperate manually cut out at 1 Shut down. NOTE: There was no on the previous run:	REMARKS be used for this start. 1280 rpm with 630 pph fuelph. The starter air pressure of 282°F. The starter 3000 rpm and 29 seconds. oil leakage noted on this may have been due to high	1:16 TEST OFFERVER Cardwell SAN AFADINS 30.03" Hga 1 flow. The peak sure was 57½ psig r switch was
# 11 SEC 11 SEC 11 SEC 12 SEC 13 PM	THE TO HEACH 5000 APP AND 39 SEC FUNTOSE OF HUN To check oil leakage NOTE: The MA-2 will The engine fired at fuel flow was 1968 p with a peak temperate manually cut out at 1 Shut down. NOTE: There was no on the previous run	REMARKS be used for this start. 1280 rpm with 630 pph fuelph. The starter air pressure of 282°F. The starter 3000 rpm and 29 seconds. oil leakage noted on this may have been due to high	1:16 TREST DESERVER Cardwell SAR READINS 30.03" Hga 1 flow. The peak Sure was 57½ psig r switch was run. The leak
# 11 SEC 0MH 22 SEC 02 PM	To check oil leakage NOTE: The MA-2 will The engine fired at fuel flow was 1968 p with a peak temperate manually cut out at Shut down. NOTE: There was no on the previous run:	be used for this start. 1280 rpm with 630 pith fue ph. The starter air pressure of 282°F. The starter 3000 rpm and 29 seconds. oil leakage noted on this may have been due to high	Cardwell SAN ARADINS 30.03" Hga 1 flow. The peak sure was 57½ psig r switch was run. The leak
# 11 SEC 0MH 22 SEC 02 PM	To check oil leakage NOTE: The MA-2 will The engine fired at fuel flow was 1968 p with a peak temperate manually cut out at Shut down. NOTE: There was no on the previous run:	be used for this start. 1280 rpm with 630 pinh fue ph. The starter air pressure of 282°F. The starter 3000 rpm and 29 seconds. oil leakage noted on this may have been due to high	Cardwell 30.03" Hga 1 flow. The peak sure was 57½ psig r switch was run. The leak
11 out 22 sec spm	To check oil leakage NOTE: The MA-2 will The engine fired at fuel flow was 1968 posith a peak temperate manually cut out at the Shut down. NOTE: There was no on the previous run:	be used for this start. 1280 rpm with 630 pinh fue ph. The starter air pressure of 282°F. The starter 3000 rpm and 29 seconds. oil leakage noted on this may have been due to high	30.03" Hga 1 flow. The peak sure was 57½ psig r switch was run. The leak
8 PM	To check oil leakage NOTE: The MA-2 will The engine fired at fuel flow was 1968 p with a peak temperate manually cut out at the shut down. NOTE: There was no on the previous run.	be used for this start. 1260 rpm with 630 pph fuelph. The starter air pressure of 282°F. The starter 3000 rpm and 29 seconds. oil leakage noted on this may have been due to high	30.03" Hga 1 flow. The peak sure was 57½ psig r switch was run. The leak
8 PM	NOTE: The MA-2 will The engine fired at fuel flow was 1968 posith a peak temperate manually cut out at the Shut down. NOTE: There was no on the previous run:	be used for this start. 1260 rpm with 630 pph fuelph. The starter air pressure of 282°F. The starter 3000 rpm and 29 seconds. oil leakage noted on this may have been due to high	l flow. The peak sure was 57½ psig r switch was
ß	The engine fired at fuel flow was 1968 p with a peak temperat manually cut out at Shut down. NOTE: There was no on the previous run	be used for this start. 1260 rpm with 630 pph fuelph. The starter air pressure of 282°F. The starter 3000 rpm and 29 seconds. oil leakage noted on this may have been due to high	sure was 57½ psig r switch was run. The leak
_	The engine fired at fuel flow was 1968 p with a peak temperat manually cut out at Shut down. NOTE: There was no on the previous run	1280 rpm with 630 pg/h fue, ph. The starter air pressure of 282°F. The starter 3000 rpm and 29 seconds. oil leakage noted on this may have been due to high	sure was 57½ psig r switch was run. The leak

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AF-EGLIN ATE, PLA.

	PAGE NO.					
JET ENSINE MOD			ENGINE BERIAL		1	
J79-GE-5				GE-033585	34	
12 Sept			-40°F	MIL-J-5161F grade 1	TIME ENGINE STARTED 1929	
FUEL SYSTEM US Normal	r.p		MIL-L-7808F	NO. THE OLDIF MED DRINE WIN	19:3025	
Test operator Gover			79°F	RELATIVE HUMDITY'S	TOTAL TIME OF RUN	
HRS COLD SUAK			FT LUF BREAK AWAY TORQUE		3	
10½	-AJM 199)	AK.3		Maximum Crankins RPM	TOTAL TIME ON ENGINE 1:18	
Time to fine	ME TO FIRE MIN 14 MEC			MAG TET DURING START 700 P	Cail	
яли фоны тіме	MIM	BEC	To obtain starting da	29.98" Hga		
TIME	民产制	4 ,		REMARKS	<u> </u>	
1020	0		on changes made to im atures on the fuel co. The number of holes i was reduced from 4 to reduces the pilot wal. A new orifice assy, we which supplies the mate to the differential pathe standpipe design holes supplying a .04. The new orifice assy, rendering it less sendischarge pressure. The following changes pensation: 1. A close clearance 2. Nitrogen filled For the starter air valve starter has been institutions.	as inserted into the drillin fuel pump discharge prilot valve. The new origand contains eight .025 to inch diameter controlling serves to dampen the principle of the pulsations in the ware made to improve terms of the principle of the valve was added. The reference bellows was a served and B-58 piping from the called.	y at low temper- o. 27. valve bushing orting holes lled passage ressure signal fice assy. is of inch diameter ing orifice. lot valve main fuel pump mperature com- added. e valve to the	
1929	0	3	The engine fired at 1100 rpm with 650 pph fuel flow. The peak fuel flow was 1980 pph. The starter air press was 47 psi with a peak temperature of 275°F. The starter switch was manually cut out at 3000 rpm and 49 seconds.			
193 0:25	5040		Shut down; due to oil NOTO: The oil leak w pumps.	l leak.	ween the two	
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	المواد الكاراب المواد الأراب الأراب الأراب الأراب الأراب الأراب الأراب الأراب الأراب الأراب الأراب الأراب الأر	observer's log	The particular transmission of the particular particula	PAGE NO.	
JET ENBINE MODI	EL.	THE MERIAL	MO.	באישעא.	
J79-GE=5	-		GE-033585	35	
DATE 13 Sept :	1967	-55°F	MIL-J-5161F Grade 1	D912	
Normal	20	MIL-1-7808F	אנה באוג שבי שונ שבי שניה אני אני. נאה אני שניה ו	THE ENGINE STOPPED	
TEST SPERATOR		BAR. TEMPERATURE	RELATIVE HUMBITY'S	TOTAL TIME OF RUN	
GOVIET	;	478°F		TOTAL TIME ON ENGINE	
See log.	WORK TO STANK	THE BREAK MAKE HUNDING	MAXIMUM CRANKING RPM	1:19	
піме пожив	MIN 19 ***	тые то желен 5000 мэм эмм 51 же	MAK TER DURING START 720°F	Cardwell	
жин форми түмк	with SEC	Function and Starting di	eta at -65°F.	30.02" Hga	
TIME	探护網		-REMARKS	3	
To the second se		NOTE: Due to limited time available to finish test the engine will be run without repairing oil leak.			
D 8 59	ø	There was a soak of 10 hrs at -65°F before the first attempt. The engine was cranked for 30 seconds with no indication of engine light-off. The starter air pressure was 46 psig with			
		peak temperature of 225°F. Maximum cranking was 1260 rpm. The fuel flow was 600 pph. NOTE: The engine was motored to blow out raw fuel.			
2.		2nd attempt:			
0906	O	The engine was cranked for 26 seconds with no indication of engine firing. The starter air pressure was 46 paig and maximum air temperature was 282°F. The fuel flow was 610 pph and fuel manifold pressure was 52 paig.			
		NOTE: The engine was motored to blow out raw fuel. 3rd attempt:			
0912	Q	The engine fired at 1380 rpm with 650 pph fuel flow. The peak fuel flow was 1980 pph. The starter air pressure was 46 psig and starter air temperature was 288°F. The starter switch was cut manually at 39 seconds and 3000 rpm.			
0010	50/5	The throttle was pre-set to idle position and moved from idle position to 25 degrees at 14 seconds. The throttle was returned to idle position after engine fired and before 3000 returned.			
0913 APSC #0R	<u>₹</u> 04 <u>0</u>	Shur down.		ap-equinapp, Fla.	

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OBSERVER'S LOG				PAGE NO.	
JET ENDINE MODE J79-GE-5		GE-03358)		NUN NO. 36	
13 Sept 1967		TEST TEMPERATURE (SP)	MIL-J-5161F Grade 1	TIME ENGINE STARTED 1908	
FUEL SYSTEM USED		LUCK OIL SHADE	HO. LSS. OF OIL WED DURING HUN	1 3	
Normal		MIL-L-7080F	RELATIVE NUMBITY &	1909 TOTAL TIME OF NUN	
Gower		+82°F	TALL TO HOME OF THE	:01	
HRS COLD SOAK	PRIOR YO START	PY LBS BREAK AWAY TORQUE	MAXIMUM GRANXING RPM	TOTAL TIME ON ENGINE 1:20	
YIME TO FIRE	MIN 14 #EC	TIME TO REACH- 5060 RDM MH 46 SEC	MAX TPT DURING START 880	test observer Cardwell	
BAIT NWOO NUS	, MIN _ SEC	FURPOSE OF RUN To obtain data at -65	¢p	29.97" Hga	
TIME	RPM	10 optain data at -03	REMARKS	27.77 118.1	
1908	O	hrs at -65°F. Cartridge type MXU-4A/A. The cartridge was soaked 3 hrs between -40°F and -65°F while test cell temperature was being lowered to -65°F. The engine fired at 1080 rpm with 620 pph fuel flow. The peak fuel flow was 2100 pph. The peak starter breech pressure was 850 psig with an average of approximately 750 psig. Burn time was approximately 20 seconds. NOTE: ifter the last run the secondary nozzle pump was removed from the main tube and scavenge pump and replaced with a new gasket. A hose from the seal drain to the			
1908:55	5060	scavenge return oil l on the run. Shut down.	ine was installed. No l	eakage was noted	

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		OBSERVER'S LOG		PAGE HO.	
	1				
JET ENGINE MODEL		ENGINE SERIAL NO.		RUN NO.	
J79-G8-5C		TEST TEMPERATURE (FF)	GE-033585	37	
14 Sept 1967		+135°F	MIL-J-5161F Grade 1	1912	
FUEL SYSTEM USE	1507	LUSE OIL SRADE	NO. LSS. OF OIL USED DURING HUX		
Normal		MIL-L-7808F		1913	
YEST OPERATOR		SAR. TEMPERATURE	RELATIVE HUMOITY \$	TOTAL TIME OF RUN	
GOVER		+77°F	MAXIMUM CRANKING RPM	:01	
	RIOR TO START	PT LES BREAK AWAY TORQUE	MAXIMUM CRANKING RPM	1:21	
16 hrs		TIME TO REACH-	- 	TEST OBSERVER	
TIME TO FIRE	MIN 16	5100 RPM MH 55 SEC	MAX TPT DURING START 1170	Carr	
		PURPOSE OF RUN		BAR. READING	
NUN DOWN TIME	1 MM 40 SEC	To obtain data at +1:		29.94" Hga	
TIME	RPM		REMARKS		
		NOTE: The MA-2 will be used for this start. The engine was soaked at +160°F for 16 hrs and run at +135°F.			
1912	0	The engine fired at 1100 rpm with 550 pph fuel flow. The peak fuel flow was 1900 pph. The peak starter air pressure was 32.5 psig with peak temp of 425°F.			

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		OBSERVE	r's Loc		PASE NO.
					1. RUN NO.
JET ENGINE MODEL J79-GE-50		GE-033585		38	
15 Sept 1967		Soak at +1 Run at +13	60°F.	MIL-J-5161F Grade 1	OSOO
PUEL SYSTEM USED NOTES1		MIL-L-7808		NO. LBS. OF CIL USED DURING RUN	TIME ENGINE STOPPED 0801
TEST OPERATOR		SAR, TEMPERATURE		RELATIVE HUMDITY \$	TOTAL TIME OF RUN
GOWET	PRIOR TO START	+78°F	AY TORQUE	MAXIMUM CRAHKING RPM	TOTAL TIME ON ENGINE
12 hrs s	t +160°F	THE TO REACH	···		1:22
TIME TO FIRE	MM 9.6 SEC	5400 RPM	ын 39 жс	MAX TPY DURING START 1130°F	Cardwell
RUN DOWN TIME	3 MIN 21 SEC	To obtain data at +135°F.		30.00" Hga	
TIME	RPM		,	REMARKS	
0800	0	NOTE: Cartridge lot OL-10-94 batch no. B290C-183 soaked 24 hrs at +160°F. Cartridge type MXU-4A/A. The engine fired at 1300 rpm with 640 pph fuel flow. The peak			l flow. The peak
		fuel flow was 2100 pph. The peak starter breech pressure was 940 psig with an average of approximately 850 psig. Burn time was 14 seconds.			
0801	5400	Shut down.	•		
L.,	I company				

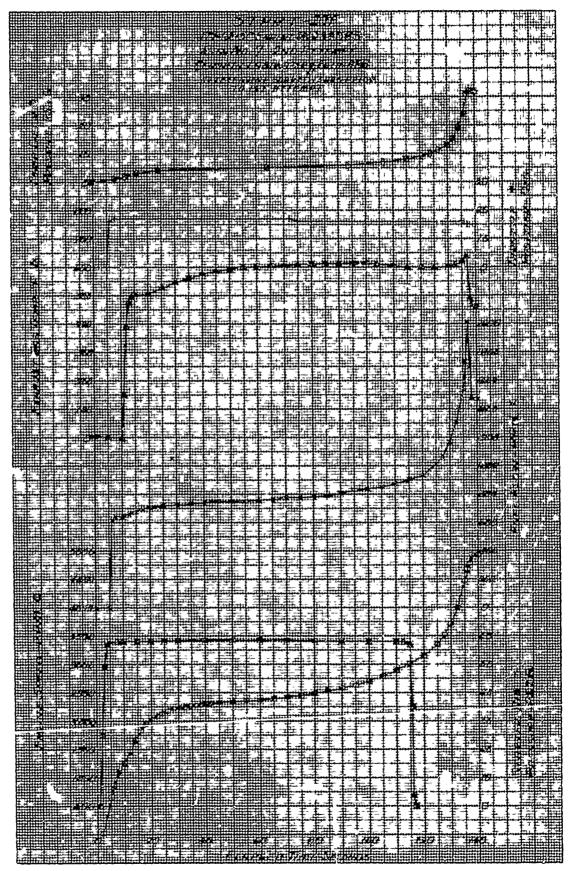
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APPENDIX F

GRAPHS OF START DATA

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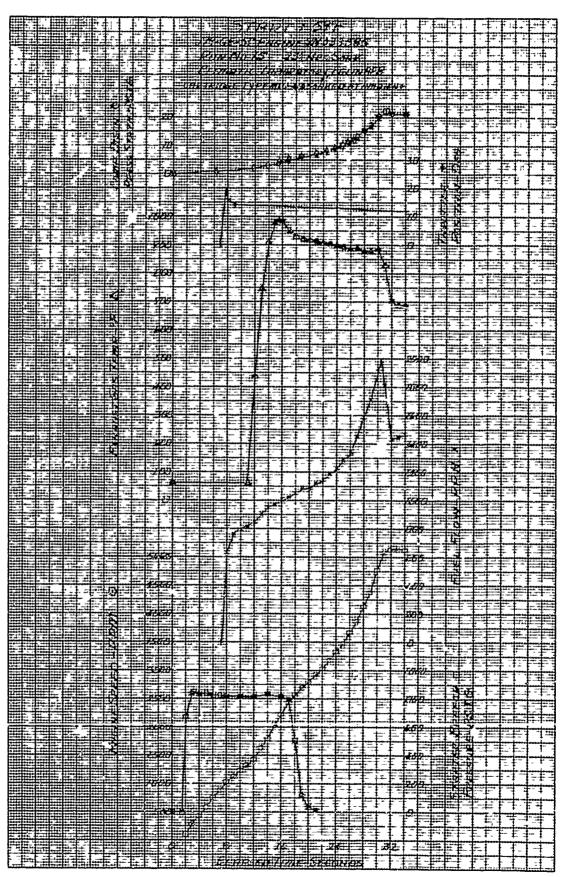
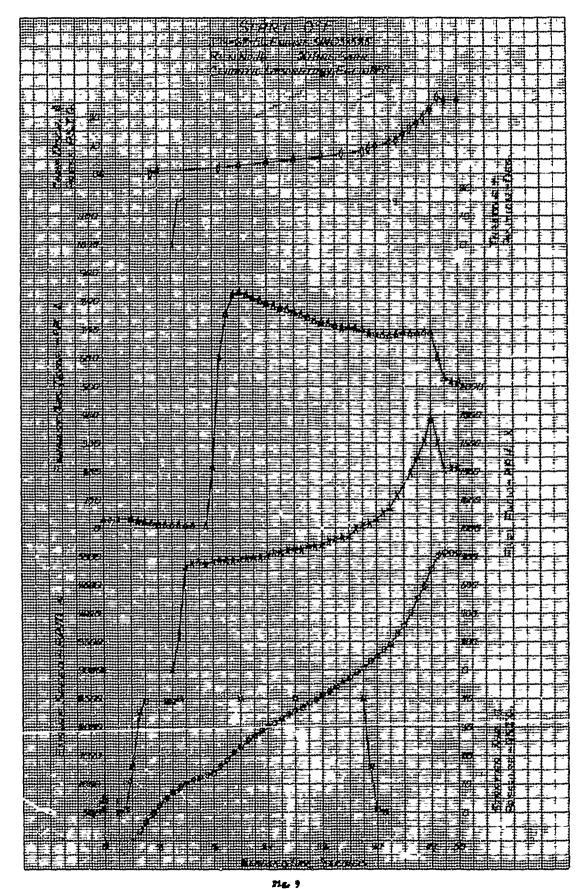
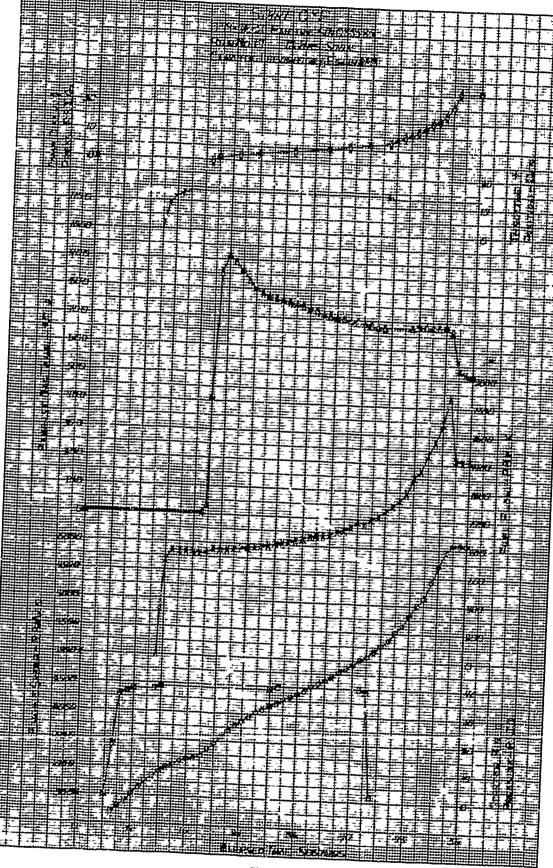


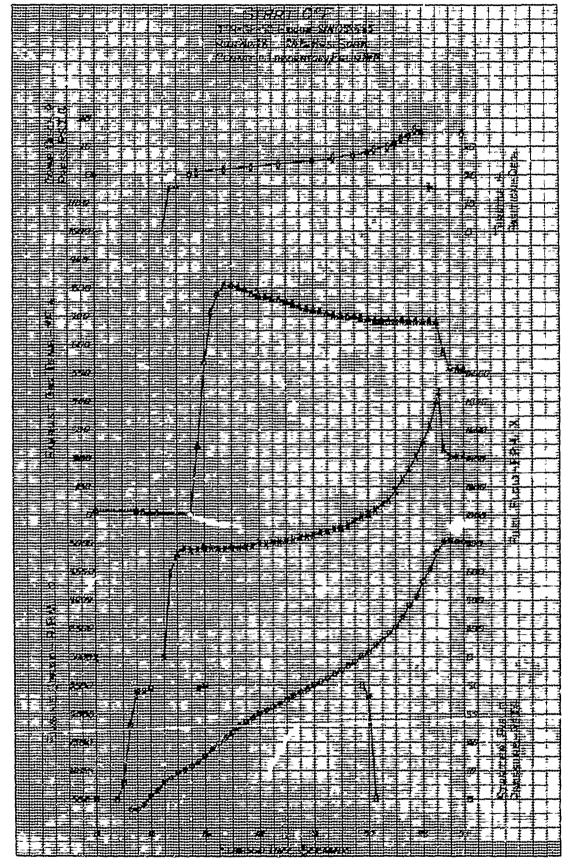
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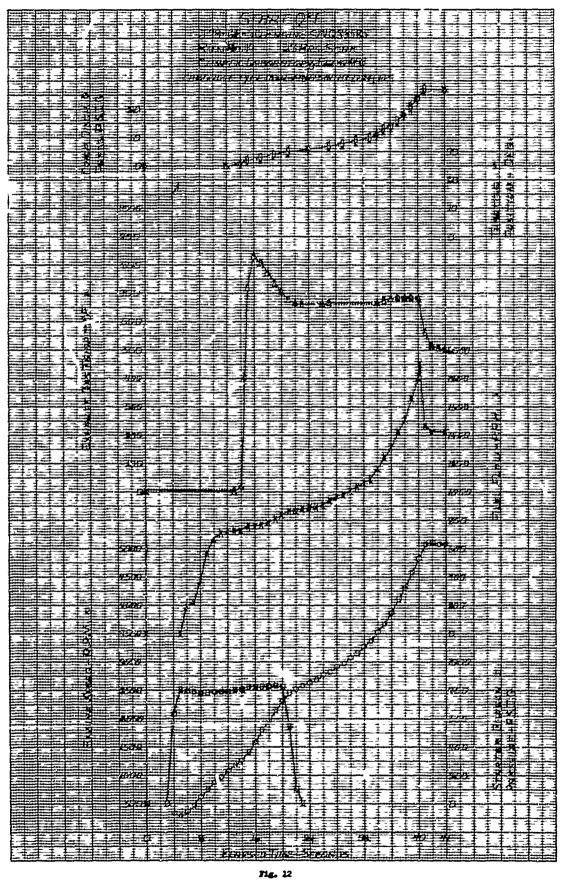


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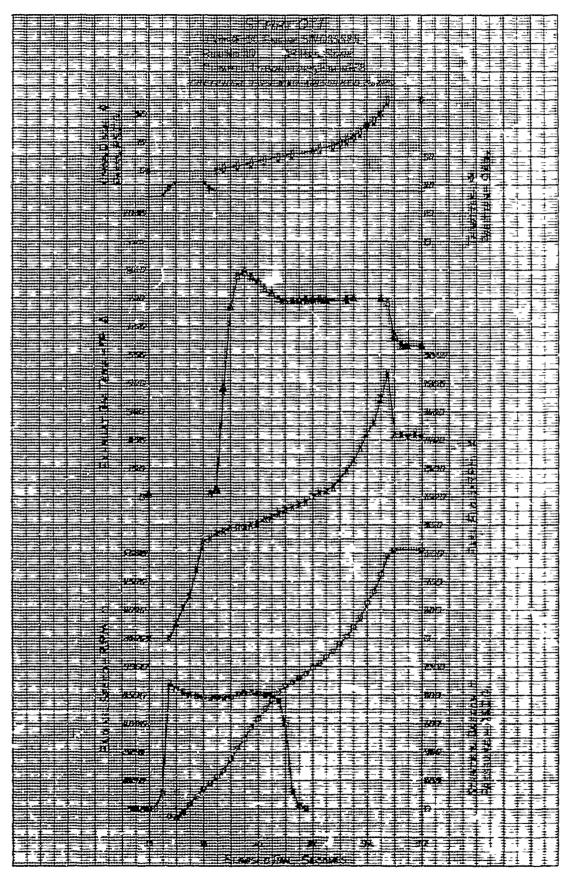
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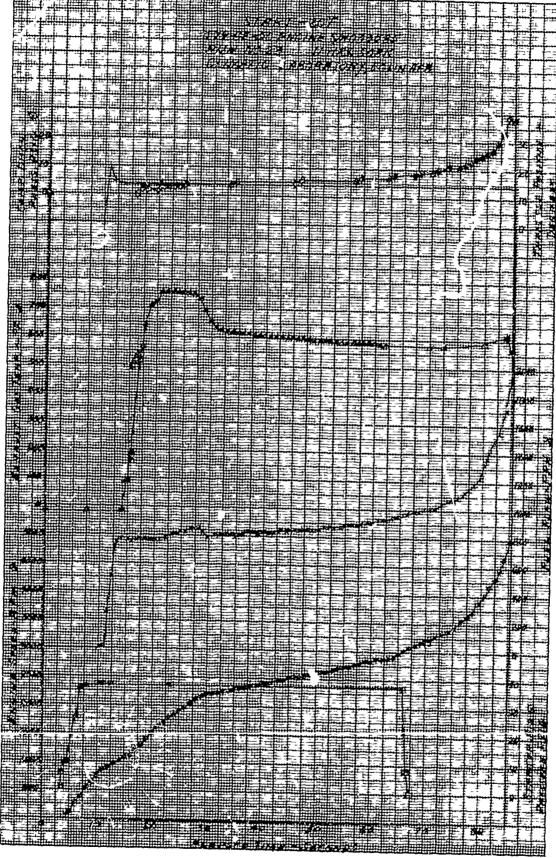


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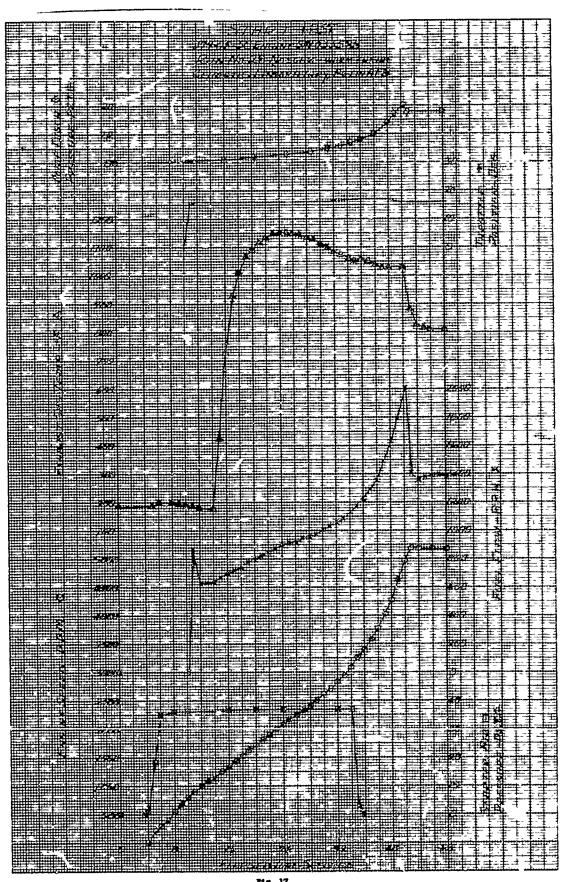
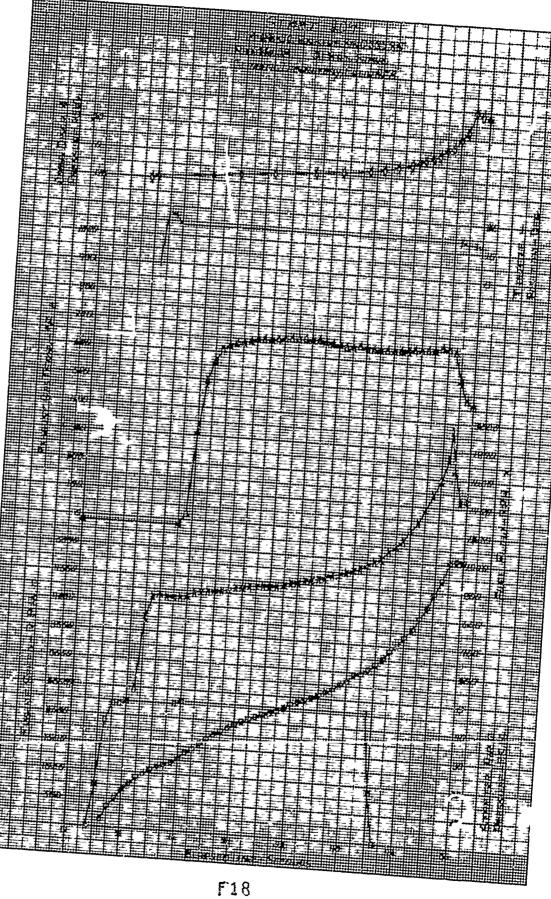
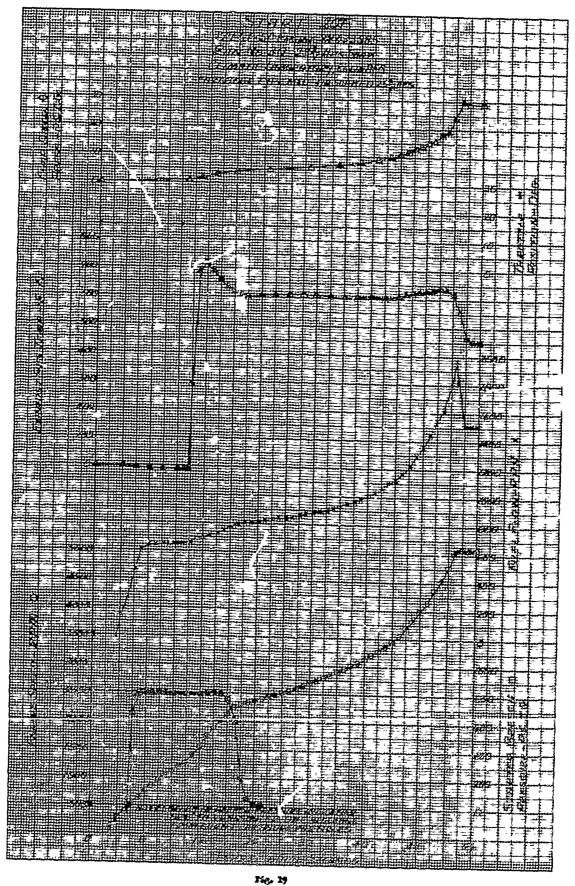


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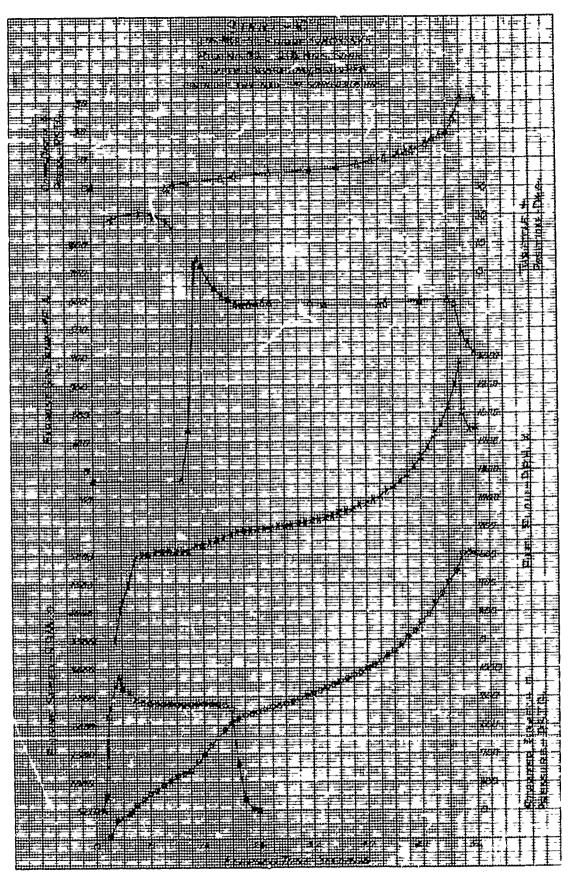




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Fig. 22



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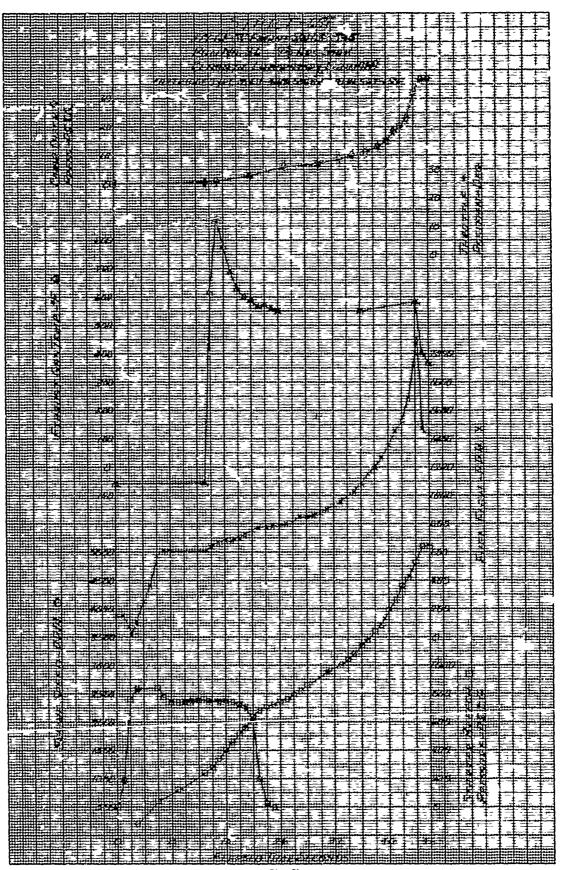


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DOCUMENT CO (Security =lassification of title, body of abstract and index)	NTROL DATA - R&I		he overall report is cleanified)					
1. ORIGINATING ACTIVITY (Gosporate author)		24. REPORT SECURITY CLASSIFICATION						
Air Proving Ground Center (AFSC) Climatic Laboratory (PGVW)		Unclassified						
		28. GROUP						
		n/A						
3. REPORT TITLE								
Hot and Cold Start Test J79-GE-5C Engine and Sundstrand Starter, Model CPS-13								
4- DESCRIPTIVE NOTES (Type of report and inclusive dates)								
Final Report 17 July - 15 September 1967								
5. AUTHOR(3) (Last name, timt name, initial)								
Goolsby, Arthur R. (PGVWT)								
6. REPORT DATE	74. TOTAL NO. OF PAGES 78. NO. OF REFS							
October 1967	91		n/A					
8a. Contract or grant no.	APGC-TR-67-126							
N/A								
à PROJECT HO.								
APGC 0816V								
c.	\$5. OTHER REPORT (IC(5) (Any other numbers that may be sealined this report)							
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13. ABSTRACT

The purpose of this test was to determine the environmental starting capability of the Sundstrand Cartridge/Pneumatic Starter, Sundstrand Proposal No. 1776A-P1 (Model CPS-13) when used on the J79-GE-5C engine. A total of 38 starts were made during this test program seven at normal ambient temperatures (75°F to 80°F) six at 0°F, nine at -20°F, three at -40°F, two at -65°F, nine at +59°F and two at +135°F. The first 11 runs of the program demonstrated that the J79-GE-5C engine, using a main fuel control, P/N 404045A (unmodified) and the Sundstrand Cartridge/Pneumatic Starter, Model CPS-13, would not make satisfactory starts at -20°F or lower. Runs 12 through 26 demonstrated that the same engine and starter combination equipped with a main fuel control P/N 407070 would not make satisfactory starts at 0°F in the pneumatic mode of starting but would meet the time to idle requirement at 0°F in the cartridge mode. Runs 27 through 38 demonstrated that the J79-GE-5C engine equipped with the CPS-13 starter and a main fuel control P/N 404045A, with the recommended modifications could make satisfactory starts through out the temparature range of +135°F through 65°F.

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14. KEY WORDS	LIN	LINK A		LINK 9		LINK C	
	NOLE	WT	ROLE	WT	ROLE	WT	
1. Hot C	old Start Test J79-GE-5C Engine						
2. 379-G	E-5C Engine						
3. Stard	er Sundstrand, Model CPS-13						
	;						

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